# AVIATION

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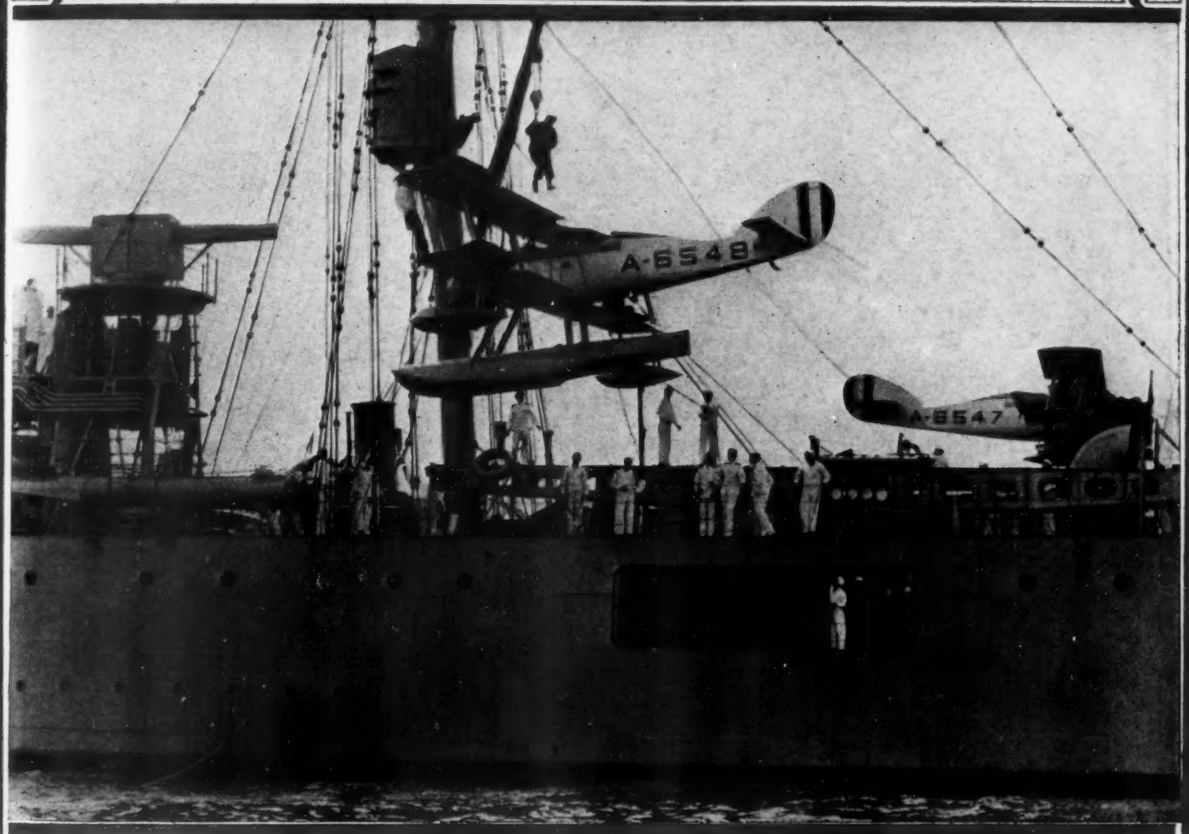


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VOLUME XV

NUMBER 6

## SPECIAL FEATURES

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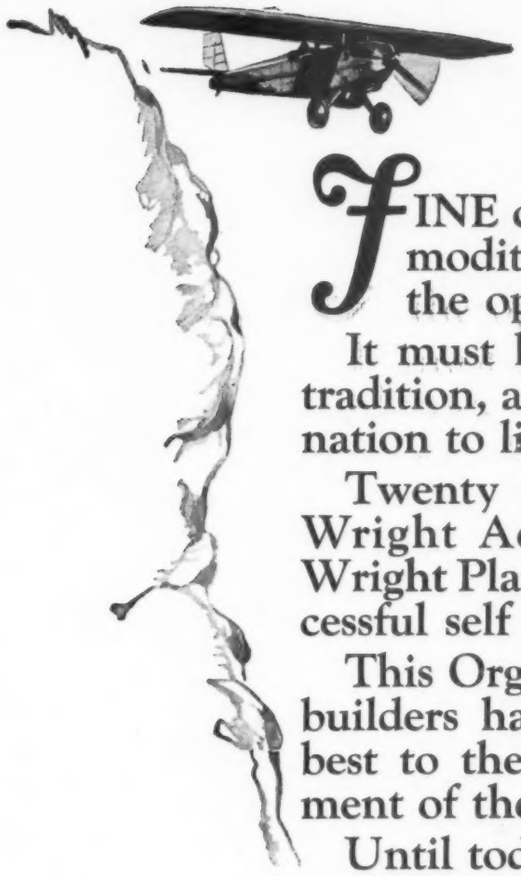

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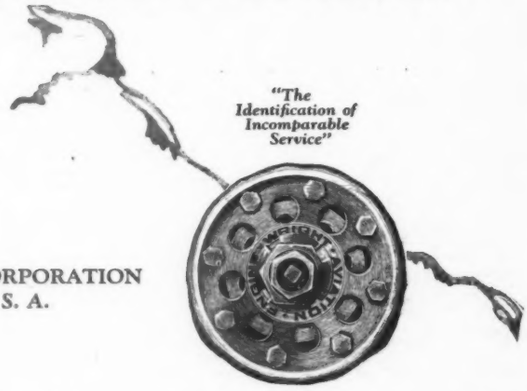


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AUGUST 6, 1923

# AVIATION

VOL. XV. NO. 6

*Member of the Audit Bureau of Circulations*

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# AVIATION

LADISLAS D'ORCY
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VIRGINIUS E. CLARK
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CONTRIBUTING EDITORS

Vol. XV August 6, 1923 No. 6

## Our Seventh Year Closes

WITH this issue, AVIATION begins its eighth year of service to American aeronautics. AVIATION is now the oldest aeronautical publication in the United States, and is the only weekly that has survived.

It is a great pleasure to express an appreciation to our reader friends for their confidence and support during these eventful years. And they have been truly eventful. We have seen the aircraft industry expand from a small shop experimental development business to a production enterprise on a huge scale. Airplanes, engines and lighter-than-air craft, with all their thousands of accessories, were manufactured throughout the World War on a scale that would have dazzled the eyes of the optimistic founders of this magazine.

It is not without a sense of pride that AVIATION mentions at this time that eight members of its staff were in service during the war, including its President, Technical Editor and Military Editor. To those who carried on the activities of publishing during this most difficult time is due the greatest credit, for in a line where practically all the news was of a confidential character and had to be given out with scrupulous discernment, there was only praise from the Services for the manner in which AVIATION recorded the progress of aeronautics under war conditions.

Since the Armistice, conditions in the aircraft industry have become increasingly difficult. Practically all of the companies that had large wartime contracts have quit the field, and as the appropriations have since been meagre, the small group of companies that have continued aircraft work have had the greatest difficulty in surviving. This depressing condition has naturally been reflected in the size of the aeronautical trade press.

AVIATION has seen its contemporaries come and go. The publishing field of flying seems to have a lure that is comparable only to the moths and a flame. The early pioneers in the field, *Aeronautics* and *Aircraft* succumbed shortly after AVIATION began publication. The brilliantly pictorial *Flying* reached a point where it had to be merged with *Aerial Age*, which struggled as a weekly and then a monthly, and now we hear, has finally joined the others that have quit. *Tale Spins* enjoyed a short but boastful life while *Air Power, Wings, The Naviator* and *Pacific Aeronautics* have all disappeared. Our friend *The Ace* still appears occasionally and *Slip Stream*, after a short intermission, has resumed as the unofficial official publication of McCook Field. *Aircraft Journal* after leading a useful existence during the war was merged with AVIATION.

So, in looking back over the seven years, AVIATION can only feel that in surviving it must have in its constructive policy that element of permanence that bids well for the future extension of its activities. Again to its readers it extends its birthday greeting and to its faithful advertisers it expresses its gratitude for their many proofs of confidence and approval.

## Between Dawn and Dusk

THE general regret felt about the failure of Lieut. Russell L. Maughan's two gallant attempts to span the continent between dawn and dusk, should be tempered by the thought that these novel and daring experiments were of considerable value to the Air Service as well as to the manufacturers of the airplane used. For one thing, it was a striking demonstration of the extraordinary mobility of this type of ship in cases of emergency, a question which the Air Service is seriously studying in connection with its war time aspects. On the other hand, the Curtiss Aeroplane and Motor Co., manufacturers of Lieutenant Maughan's plane, furnished a telling proof of the ruggedness of this new pursuit ship and its engine under extremely trying conditions. Throughout both tests, extending over well nigh 3000 miles of flying, as well as the return trip from St. Joseph, Mo., the Curtiss D12 engine functioned perfectly.

The first trial was interrupted by the presence of foreign matter in a filter heretofore considered adequate to meet any demand placed upon it. How this foreign matter got into the filter is a problem which has not yet been elucidated. The special tanks, when they were constructed, were washed out not only with gasoline but also with a diluted solution of sulphuric acid, that they might be absolutely clean. Perhaps it will be learned that new chamois should not be used for filtering gasoline, for there was found considerable fibrous material in the filter which could have come from no other source.

The second flight, made ten days later, was again interrupted, not by the faulty operation of the plane or the engine, but by accessory equipment. The oil cooler used on this plane is similar to that used in the Army-Curtiss racer which won the Pulitzer Trophy Race in 1922. It is notable that this ship has had some sixty or seventy hours in the air, prior to the transcontinental flight, without experiencing the difficulties Lieutenant Maughan contended with.

The wisdom of the Air Service in carrying out these truly heroic tests—using a pursuit ship for cross-country flying on schedule—is certainly justified by the experience and knowledge they afford. Nor can too much be said for the wonderful work which Lieutenant Maughan has done in this connection.

## "Emplaning"

OUR London contemporary *Flight* has enriched the English aeronautical terminology by coining the word "emplaning" to indicate embarking in an airplane. The latter circumlocution is perhaps the best argument in favor of the new term, which is both brief and descriptive.

# Welded Steel Cylinder Water Jackets

By GLENN D. ANGLE

In charge of Airplane Engine Design, Engineering Division, Air Service

The situation with regard to steel cylinder water jacket failures on airplane engines has become serious. On their first attempt at a non-stop coast-to-coast flight, Lieutenants Kelly and Macready were forced to land at Indianapolis due to the loss of engine cooling water through the opened-up welded joints in the cylinder jackets. Similar failures have occurred rather frequently during flights of lesser importance and also on the test stand. These troubles have been experienced not only with the Liberty engine, but with other power plants which employ the individual welded steel cylinder construction. Furthermore, added to the failures in the welded joints are several cases of water leaks through the jacket walls caused by rusting during engine storage. Apparently, it is now time to definitely determine the causes of these failures and, if possible, find means to overcome them.

### *Aluminum Block vs. Steel Cylinder*

Of late, there has been a growing tendency among engineers interested in airplane engine development, to unconditionally adopt the aluminum block construction in preference to the individual welded steel cylinder. Can this possibly mean the passing of the welded steel cylinder because of the above mentioned failures, or is it only taking advantage of some of the features which the aluminum block form of cylinder construction presents? In most cases, no doubt, the reasons are two-fold, and in new designs the selection is warranted if the desired results cannot otherwise be obtained. However, the substitution of the aluminum block construction for the individual steel cylinders of some existing engine is merely a design compromise. This is explained by the fact that some of the more important features of the block construction cannot be fully attained.

The form of cylinder construction to be used for any water-cooled airplane engine should be determined by the nature of the service, the size, number, and arrangement of cylinders, and the normal speed of rotation. In other words, the selection will be largely influenced by the center distances of adjacent cylinders as governed by other factors, such as the required length of the crank-pin and the crankshaft main journals. It is unfair then to judge the relative merits in these two forms of cylinder construction unless concerned with some specific set of conditions.

The individual steel cylinders give the lightest structure when spaced relatively far apart. On the other hand, when compactness is mainly desired and the cylinder spacing is not greatly limited by other design factors, the structure as a whole will weigh less if some form of aluminum block cylinders is employed. It is not difficult to select the lightest construction after the cylinder center distances have been determined.

The salient features of the block cylinder construction as compared with the individual types, aside from the weight and compactness point of view, are greater rigidity, decrease in the number of exposed joints and water connections, and the better opportunity to provide an inclosed valve gear and thus reduce the amount of oil leakage. Perhaps the principal disadvantages are the increased costs of manufacturing and maintenance.

Rigidity is ordinarily supplied to any single row of individual cylinders by the overhead camshaft housing and common inlet manifolds. In many cases, however, this does not prove sufficient and any weakness or flaw in a welded joint of the water jacket is liable to open up under the severe strain set up by too much freedom of movement. These strains can be greatly relieved by proper care in the design of the cylinder, as will be explained later; but when these failures occur on existing engines, the correction can only be made by further constraining these movements. If the required stiffness is supplied to a single row of cylinders, the amount of weight added would be prohibitive in the majority of cases; therefore, in the Vee or W type engines, it is better to brace one row of cylinders against the other. This is often accomplished through carburetor flanges or water outlet connections and gives better results, no doubt, than any specially designed bracing of a more rigid nature.

Some designers avail themselves of the inherent advantage in both types of construction by forming the cylinder heads of a single row in one block, and the barrels with welded-on jackets separately. This should give the required rigidity, and is even lighter than most forms of block construction

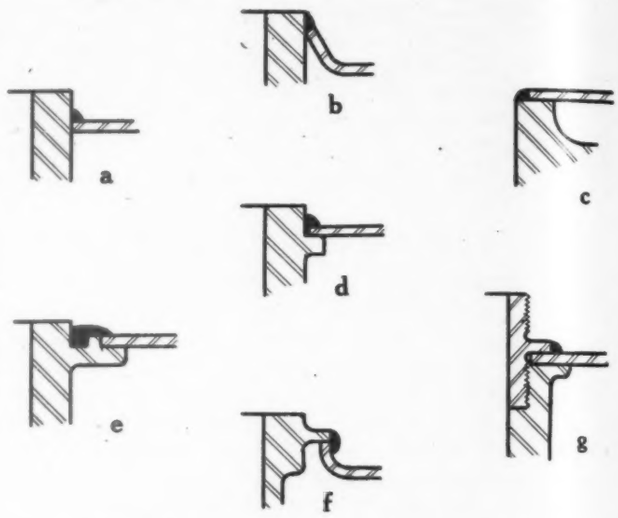



*Fig. 1—Welded Joints employed for attaching the Water Jackets to the Cylinder Head and Valve Port Flanges*

when the cylinders are spaced sufficiently close for its use. The Napier "Lion" engine is perhaps the best modern example of this kind.

The first airplane engine employed sheet-steel water jackets. This was the Manly five-cylinder radial engine that was installed in one of Professor Langley's experimental machines. These jackets were brazed onto drawn steel cylinders in which liners of cast iron were later fitted.

The cylinders employed on most of the other early engines built for aircraft use, were cast iron with integral water jackets. These cylinders naturally followed closely the form of construction used in automobile engines; but it was soon realized that the cast water jackets constituted altogether too large a proportion of the engine weight, and designers turned their attention to attaching separately formed metal jackets of thin section. Various kinds of material and methods of attaching have been tried.

Several constructors adopted the copper water jacket attached to cylinders of cast iron. In this country, the Hansen-Snow engine and the first engine built by Aeromarine had electrolitically deposited jackets. On the latter engine, however, the copper jackets only surrounded the cylinder barrel. Curtiss, Elbridge, Rausenberger and Snadecki attached spun copper jackets, and so did Van Blerck, but in the latter case the cylinders were made from steel. Some of the later Curtiss engines extensively employed the brazed-on monel metal water jacket to both cast iron and steel.

In France, the copper jackets were used by Antoinette, Panhard, Salmson, Clément-Bayard, Darracq, and Clerget. These cylinders were all made from steel. The electrolitically deposited copper water jackets, found only among the above on the Antoinette engines, were among the first ever used. Panhard built engines having steel cylinders with copper

water jackets as early as 1903, and in 1908 this firm built four sizes of airplane engines which employed the same type of cylinder construction.

The German built N.A.G. engines had copper water jackets held to the cast-iron cylinder by spring rings, and the Adler engines used corrugated copper jackets attached to forged steel cylinders. The well-known Austro-Daimler engines, which were built in Austria, used copper water jackets attached to cylinders of cast iron.

The British built Beardmore engine cylinders were practically identical with those on the Austro-Daimler engines. Two other designs built in Great Britain were also known to have used copper jackets. The Dorman engines had spun copper jackets attached to cast-iron cylinders by steel bands, while the jackets of the Green engines were made water tight by rubber rings. The Isotta-Fraschini engines, which were built in Italy, have used cylinders cast in pairs of grey iron with both copper and steel water jackets attached by a number of small screws.

Considering the probable experimentation connected with developing the designs referred to above, it is readily concluded that the art of metal water jacket construction has received much attention. With the development of the autogeneous welding processes, the all-steel cylinder soon became the most popular form of construction. This type has been used in larger quantities by manufacturers in all countries than any other kind of cylinder, and it therefore demands more than passing consideration.

## Foreign Practice

The welded-on steel water jackets are found on practically all German built airplane engines. These include the Argus, Bassé-Selve, Benz, B.M.W., Koerting, Maybach, Mercedes, and Rheinische. The lower end of the jacket on the Maybach engines, however, is made water tight by a packing. Cast-iron cylinder heads with steel barrels are used on the Bassé-Selve, Benz, and Maybach, as well as on some of the early Mercedes designs. Many credit the German engineers with the development of the welded steel type of cylinder construction; at any rate, their designs appear to have been rather closely copied in several other countries.

In Austria, the later Austro-Daimler designs and the Hiero engines used the welded-on steel jacket construction. Lorraine-Dietrich and Renault have built several airplane engines with this type of cylinder, but they are the only French firms

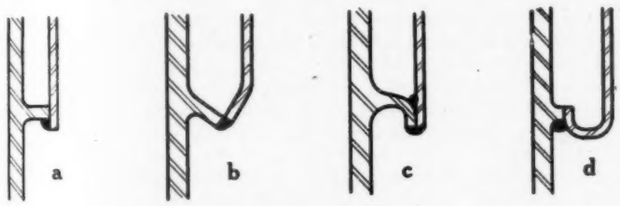



*Fig. 2—Typical joints for welding lower end of the water jacket*

known to have used this construction to any extent. The Lorraine-Dietrich cylinders are made up in pairs and surrounded with a common water jacket. This is permitted by the closeness of two cylinders as a result of the spacing necessary with a three-bearing four-throw crankshaft or a four-bearing six-throw crankshaft.

The airplane engines built in Italy, that have cylinders with sheet-steel water jackets, include the Ansaldo, Colombo, Fiat, Lancia, and S.P.A. The Colombo cylinders and the cylinder heads of the Lancia engine are cast iron. The S.P.A. cylinders are welded-up in pairs and surrounded by a single water jacket for both.

The British-built Galloway engine cylinders have cast-iron heads, steel barrels, and clamped-on sheet-steel water jackets, but on the other British airplane engines, the sheet-steel jackets are welded in place. The list includes the Rolls-Royce, Argyll, Vauxhall, R.A.F. 3a, Napier "Cub", and the Sunbeam "Sikh" engines.

In this country, the Harriman engines and some of the designs built by Duesenberg had cylinders of cast-iron. The Martin engine cylinders were built up in pairs of steel, while the individual all-steel construction is found on the Hall-Scott, Packard, Liberty, and Engineering Division—Air Service—Model W-1-A engines.

A complete history of the experience with the majority of engines mentioned above would be difficult to obtain, particularly with reference to those which have been built in other countries. However, the continued use of the individual steel cylinder with welded-on sheet-steel water jackets, by some of the best known airplane engine manufacturers abroad, would lead to the belief that no serious difficulties have been encountered in the development of this form of cylinder con-

*Fig. 3—Typical joints for welding together two-piece jackets*

struction. At any rate, this is assumed to be the case, and the discussion of water-jacket failures must then be confined to domestic designs.

The joints for welding the jackets to the cylinder must be so designed that the welding operations are simple and rapid; in other words, the welds should be made with the minimum possible quantity of heat. In order to do this, the parts to be welded should correspond in section at the joint and thus require very little pre-heating. Sometimes a careless welder will burn away the jacket while pre-heating the heavier section, and the result will be a poor weld which frequently contains oxides or other impurities.

## Types of Sheet Metal Welds

The best method in welding sheet-metal to a steel forging is to first fuse the two parts and then fill in or build up with welding wire. The welding wire giving the best results is a good grade of Swedish iron, copper-coated wire being preferred as this reduces the quantity of oxides flowing into the joint. The operator should delay the application of the welding wire sufficiently to allow the two parts that are to be joined to reach the proper welding heat. Cases are known where the wire was built up over the joint, welding itself to each member, but the jacket and cylinder themselves were merely in contact. Welds made in this fashion may hold under static pressure tests, but they actually open-up during operation as a result of vibration.

Several types of joints used for welding the jacket to the cylinder, particularly at the valve port flange, are shown in Fig. 1. The joint shown at (a) is the type employed on the Mercedes, Fiat, and Lorraine-Dietrich engines. Experienced welders are required to make this type of joint as it is difficult to direct the flame of the torch against the heavy section during preheating without over-heating or burning the jacket. The joint shown at (b), which is used on the Bassé-Selve engines, is perhaps easier to weld because the corner requires less time to pre-heat and the jacket is not so liable to burn before the weld is made. The joint shown at (c) is quite similar; this type of weld is used on the Austro-Daimler engines.

A number of firms that build steel cylinders use the type of jacket weld shown at (d). This joint, in addition to the features presented by the types of welds shown by (b) and (c), permits a heavier weld to be made and requires less care as regards overheating the jacket. The German Benz engines have this type of welded joint between the water jacket and the valve port flange of their cast-iron cylinder head. From the point of view of welding, the joint (e) is quite satisfactory. It can be criticized, however, in that it requires rather expensive machine operations, but this expense is partly offset by the fact that less skillful welders can be employed for these operations. The "Liberty", Engineering Division—Air Service—Model W-1-A engines, and others use this form of weld. Very often the shape of the jacket cannot be easily made to conform with the shape of the cylinder head or flange to which it is to be attached. In the case of a reverse bend, the form of joint shown at (f) will give good results. This joint resembles type (e), but it is not as capable

of holding together under vibration, nor is it as easy to fit before welding. A special joint used in the Hiero engines is shown at (g). The inlet and exhaust port flanges are screwed into the cylinder head to a seat, the jacket being clamped between the head and port flange. The weld then locks the port flange in position and makes the jacket joint water tight.

In Fig. 2 are shown typical welded joints for the lower end of the water jacket. Type (a), which is common to the Mercedes engines, is perhaps the simplest design, but requires greater care in welding than the designs shown by (b) and (c). Type (b) is found on the Hiero engines and type (c) on the "Liberty", as well as on several others. In these joints a satisfactory weld can be made without using very much welding wire, as the jacket and the thin flange of the cylinder will fuse very readily. Type (d) is a special design used on the Fiat engines. The only apparent advantage in this joint is the possible allowance for expansion to relieve the strains in the weld.

Water jackets are generally made in two pieces, thus a vertical weld is necessary to join them. Fig. 3 shows the two methods used. For the joint shown at (a), the jackets are brought almost in contact and then tack welded. During the final weld, a certain quantity of welding wire flows on the interior of the jacket and forms a lock of a section similar to a rivet. This joint is the one usually employed, and is entirely satisfactory if well made. Type (b) is simple from the point of view of welding, but requires additional forming in the jackets and detracts from the appearance and ease of handling. The Napier Company use this design for both "Lion" and "Cub" airplane engines.

In the sketches of the various designs of welded joints, no account is taken of that part of the jacket or cylinder which forms the weld. The original shape is shown plus the addition to the average good weld after it is finished. Although the descriptions are brief and no specific cases are discussed in detail, it is apparent that the joint design should be selected principally with a view of facilitating the welding operations.

### *Relative Position of Joints*

The relative position of the joints and the order in which they are welded are also of great importance. Strains are set up if the jacket is not free to contract during the cooling after welding. This means that the jacket should be free, on one side of the weld at least, in order not to highly stress a weld that is already made. The welding operations should then progress from one end of the cylinder to the other after tack welding or clamping the jackets in their proper position. The experience with several modern steel cylinder designs indicates that the best method is to start welding at the top and make the final weld at the lower end of the jacket. The strains set up by the last weld are greatly relieved by the corrugations in the jackets. From a design point of view, this is the real reason for corrugating the water jacket, although it is assumed by many to be mainly for the purpose of relieving the strains of expansion due to the heat during operation. The contraction of the metal after welding, however, is always greater than the expansion during running.

TABLE I. DATA ON ENGINES USING WELDED STEEL CYLINDERS

| *Engine* | *Rated Hp.* | *No. Cyl. & Type* | *Bore In.* | *Stroke In.* | *Displacement per hp.* | *B.m.e.p.* | *Compression Ratio* |
|---|---|---|---|---|---|---|---|
| Benz | 200 | 6-V | 5.51 | 7.48 | 4.83 | 117.0 | 5.80 |
| B.M.W. | 185 | 6-V | 5.91 | 7.09 | 5.86 | 96.4 | 6.51 |
| Fiat "A12" | 300 | 6-V | 6.3 | 7.09 | 4.40 | 112.0 | 4.67 |
| Fiat "A14" | 650 | 12-Vee | 6.69 | 8.27 | 5.36 | 98.9 | 4.98 |
| Hall Scott "L6" | 200 | 6-V | 5.00 | 7.00 | 3.85 | 120.5 | 5.30 |
| Liberty-6 | 200 | 6-V | 5.00 | 7.00 | 3.57 | 130.5 | 5.42 |
| Liberty-8 | 290 | 8-Vee | 5.00 | 7.00 | 3.79 | 123.0 | 5.42 |
| Liberty-12 | 400 | 12-Vee | 5.00 | 7.00 | 3.92 | 119.4 | 5.42 |
| Maybach | 300 | 6-V | 6.50 | 7.09 | 4.96 | 112.9 | 5.91 |
| Mercedes | 180 | 6-V | 5.51 | 6.30 | 4.90 | 114.4 | 5.48 |
| Mercedes | 260 | 6-V | 6.30 | 7.09 | 5.25 | 107.5 | 4.94 |
| Napier "Lion" | 450 | 12-W | 5.50 | 5.125 | 3.24 | 127.0 | 5.53 |
| Packard "744" | 180 | 8-Vee | 4.75 | 5.25 | 4.15 | 119.5 | 5.02 |
| Packard "1116" | 280 | 12-Vee | 4.75 | 5.25 | 3.96 | 125.1 | 5.56 |
| Packard "2025" | 550 | 12-Vee | 5.75 | 6.50 | 3.75 | 117.1 | 5.08 |
| Rolls-Royce "Eagle VIII" | 360 | 12-Vee | 4.50 | 6.50 | 3.52 | 123.9 | 4.88 |
| Rolls-Royce "Condor" | 625 | 12-Vee | 5.50 | 7.50 | 3.29 | 126.5 | 5.17 |
| SPA 6A | 210 | 6-V | 5.31 | 6.69 | 4.24 | 113 | 5.30 |
| USA Model W1A | 800 | 18-W | 5.50 | 6.50 | 3.47 | 127 | 5.40 |

Cylinders which are apparently free from failures in the jacket welds under normal operation will often give considerable trouble from this same source when run at a higher compression ratio or at maximum brake mean effective pressures. The obvious explanation is that the higher force of explosion, accompanied by occasional detonation which is always present under these conditions, set up vibrations that become altogether too severe for imperfect or highly stressed welds.

Table I gives some data on several well-known airplane engines that have welded steel cylinders. Over half of the engines listed develop less than 120 lb. per sq. in. brake mean effective pressure; however, these engines are mostly pre-war

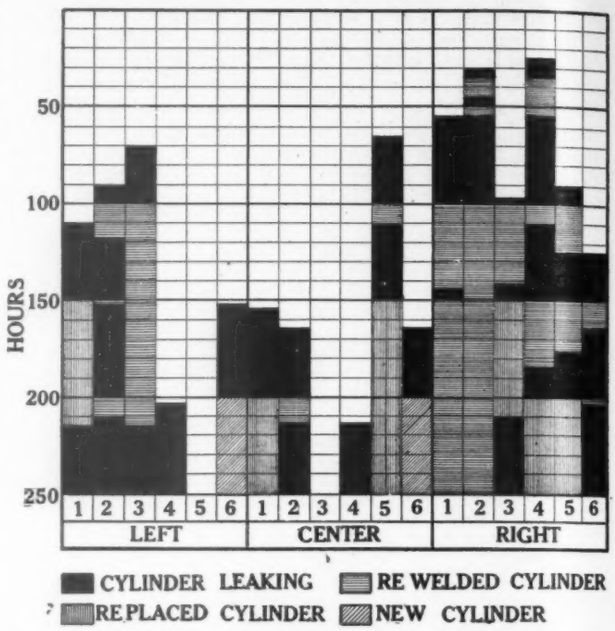



*Fig. 4—Chart showing Water Jacket Failures during the Endurance Tests on the Original Model W-1-A Engine*

designs and the majority developing higher mean pressures are of more recent design. This table then shows that, in general, the output of steel cylinders has been gradually improved. The failures of jacket welds in any engine of recent development can at least be partly ascribed to the severe conditions imposed upon them by increased power output.

The above statements, however, do not imply that there are any limiting values on brake mean effective pressure or horse power per cubic inch piston displacement with cylinders using welded steel water jackets. Some data which follows is sufficient proof that correctly-designed, properly-welded jackets will not fail, regardless of the power output. At this point it is only proposed to direct attention to the fact that, as the output increases, the design and construction should be likewise improved in order not to introduce jacket failure.

### *Experience of McCook Field*

A brief history of the experience with water jacket failures on the Engineering Division—Air Service—Model W-1-A engine may be of interest here. A chart showing the failures with the original design of cylinders during five 50 hr. endurance tests is given by Fig. 4. Improvements in the design of these cylinders were naturally made as new cylinders were constructed, however, the original cylinders were used for these endurance tests which were conducted mainly for other reasons. In Fig. 4 the solid portions show the time during which the engine was run with jackets leaking. The horizontal cross section lines indicate the periods run with cylinders that were re-welded. The vertical lines indicate replaced cylinders of identical design, while the diagonal lines are for replaced cylinders of new design. This chart only takes into account the time recorded during the endurance tests, several more hours having been consumed for warming-

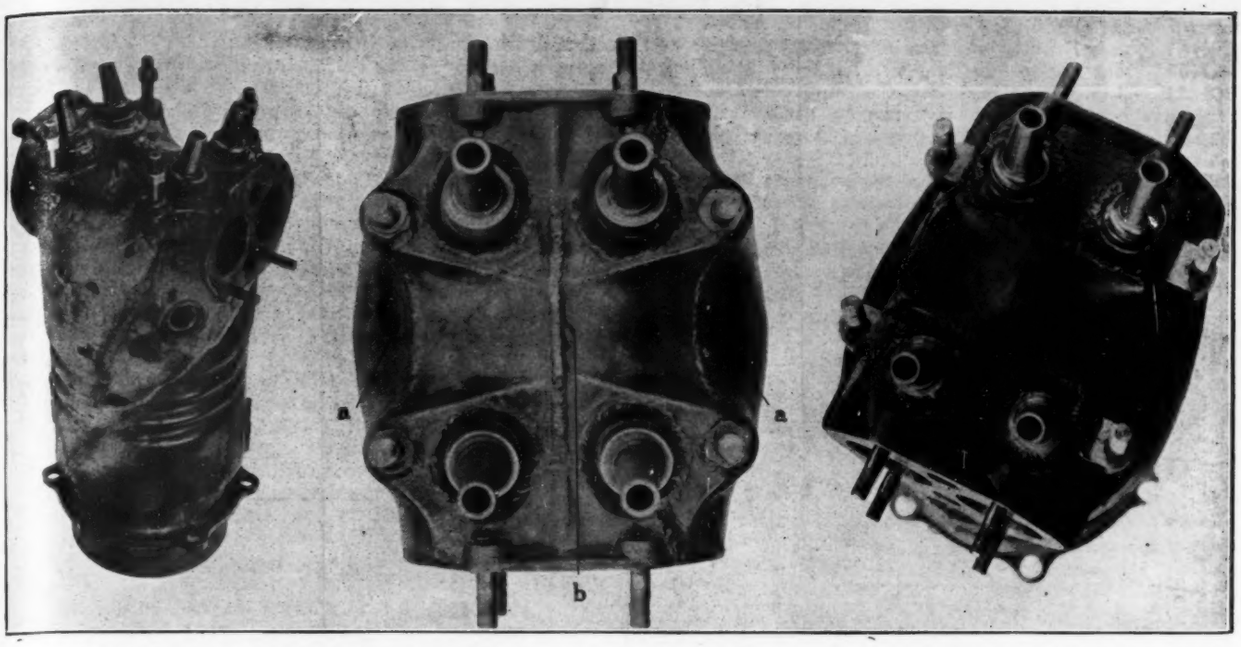



*Fig. 5 (left). Original Model W1A engine cylinder after test.—Fig. 6 (center). Top view of Model W1A cylinder of the second series.—Fig. 7 (right). Present design of Model W1A engine cylinder*

up and check runs. It should also be realized that the life of an engine tested in this manner is perhaps only half of what it would be during flying service. The workmanship on these particular cylinders as regards welding, is considered, at best, of only average quality.

During the first fifty hours, two cylinders showed leaks shortly after the run was half completed. Both were re-welded, but one again leaked before the test was finished. At the end of the second fifty hours, eight cylinders were leaking, two of these being the ones that were re-welded during the first period. The third fifty-hour endurance test started with the eight cylinders which leaked in good repair. Only two of these finished without again showing leaks, and since two others began leaking for the first time, the total number of defective cylinders was again eight. The fourth period was started with three new cylinders of the same design replacing three which were not considered worth repairing. None of these cylinders developed leaks during this period, but four re-welded cylinders and four, which up to this time had not leaked, were found defective. The fifth fifty-hour period started with two cylinders of a later design which it was desired to test. These cylinders did not fail, neither did three new cylinders of the original design that were installed at the beginning of the period. However, two of the new cylinders which functioned satisfactorily during the previous fifty hours, two which up to this time had not failed, and four of the re-welded cylinders were found to be leaking. One of the original cylinders is shown in Fig. 5. Attention is directed to the lime deposit on the outside of the cylinder caused by leaking water.

### *Failures due to Defective Welding*

The above failures could be entirely attributed to defective welding, though it is recognized that the same quality of welding might not have given any trouble at the same power output if the cylinders had been mounted rigidly and the joints free from welding strains and vibration. Later improvements in design were made with this object in view. These endurance tests quite definitely proved that re-welding the jackets is not satisfactory. Not a single repaired joint came through these tests without a second failure. The heat of welding will sometimes crack the jacket or weld adjacent to the area being repaired, and in any event it is sure to set up strains in other welded joints.

Fig. 6 shows a top view of a cylinder of the second series. This cylinder incorporates several design improvements, but, unfortunately the joints were very poorly welded, being much inferior in fact to those of the original cylinders. The joints in the plane of the two camshaft housing bosses designated (a) were only to close an opening in the jackets that was made necessary in their forming. The joint (b) at the top of the head has been re-welded, this joint having failed frequently due principally to the strains set up by welding it after the joints at (a). Several failures occurred around the lower edge of the valve port flanges, being attributed mostly to the fact that the lower end of the jacket was welded previously, hence no freedom was allowed for the contraction of cooling after welding.

### *Cylinders that Leaked*

Single cylinder tests were conducted on several cylinders of the second series. The first one had a slight leak under 25 lb. per sq. in. static water pressure prior to running. After one hour it leaked badly and had to be re-welded. The second cylinder showed a leak near the intake valve port flange after ten hours running. A leak at the same point occurred on the third cylinder tested after 29 hr., and after re-welding it again leaked at 42 hr. The fourth cylinder began leaking at this point after 26 hr. running, the repaired joint after 35 hr., besides one on the exhaust side at 43 hr. These failures are practically all traced to faulty welding.

So far, practically no mention has been made about water jackets that did not fail. The cylinder shown by Fig. 7 incorporates several improvements made especially to facilitate the welding operations. Among these improvements, the most important are perhaps the stiffened valve port flange and the elimination of the welded joint across the head. This cylinder ran 50 hr. at wide open throttle under violent detonation, but failed to develop a water leak. This same cylinder, together with one exactly like it, were run on the original engine during the fifth 50 hr. endurance test with a perfect record.

This design was therefore proven, however, at the end of a 50 hr. endurance test of the first engine with similar cylinders, only two had not developed leaks. An examination disclosed the fact that most of the joints were not even welded. The welding wire had closed the joint, but the flange and jacket were not welded together. Jacket failures will surely follow if the weld is not complete.

A similar cylinder that was properly welded has to date done 28 hr. full throttle running under the most severe conditions, besides several hours at part throttle, without a failure.

These tests were conducted at compression ratios ranging from 5.04 : 1 to 6.46 : 1. With the cylinder mounted on the Universal Test Engine, brake mean effective pressures were recorded from 130 to 150 lb. per sq. in., corresponding to 148 and 163 lb. per sq. in. indicated mean effective pressures, respectively. This output is obviously sufficient to cause jacket failures if the forces of explosion alone can be responsible.

It is evident, at this point, that the weld must be complete and reasonably free from impurities; however, the best welders cannot always guarantee an absolutely perfect joint, and in production it should not be expected. The designer

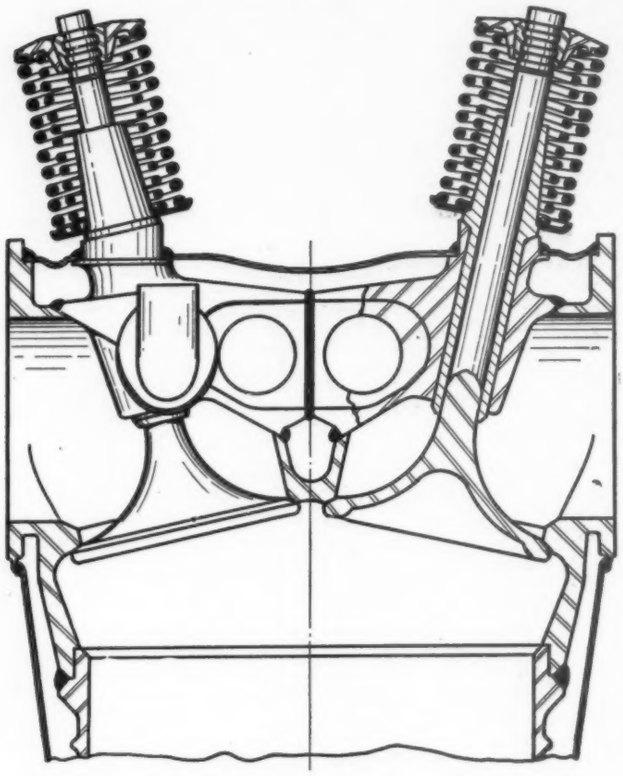


*Fig. 8—Proposed design for bracing cylinder head*

must consequently make certain allowances, and arrange the joints so that no strains are introduced during welding. Moreover, he should provide the necessary rigidity in the design to resist vibration.

The combustion chamber wall thickness should be sufficient to prevent flexing under the forces of explosion, and the valve ports and flanges should be stiff enough to prevent deflection, particularly with respect to each other. The design shown by Fig. 8 is proposed as a simple and effective method of bracing. This is a two-valve design, in which the head, valve ports, and flanges are forged in one piece. The absence of so many welds in the head aids materially in reducing welding strains and distortion. These special valve guide bosses are attached to the ports by a simple weld, after which the extensions are joined at the center by welding. This forms a tie between the guide bosses, thus bracing the head and relieving the jacket joints, which are later welded, of any strains due to distortion. Another feature of this design is the added cooling surface on the guide boss which should greatly assist in the transfer of heat from the valve to the cooling water.

Various schemes of bracing can be used more or less effectively, depending on the design of the cylinder. A heavy top plate joining the valve port flanges is sometimes used in place of the thin jacket, but these cylinders are usually too heavy, and at least two designs are known that have given considerable trouble in welding.

Unfortunately, the experience gained on one particular cylinder design is not always directly applicable to other designs; nevertheless the above discussion points out many general problems which must be taken into account. An attempt has been made to prove that successful welded steel cylinders can be produced if properly designed and constructed, and the same, of course, is just as true with the aluminum block or any other type of cylinder construction. It is not considered good engineering practice to purposely avoid the problems in welded steel cylinder design by adopting the aluminum block construction for an engine layout to which the latter is not peculiarly suited. The foundry problems with the aluminum block cylinders are perhaps just as great on the average as those of welding on the individual steel types. Aluminum castings must not be porous, otherwise water leaks will naturally occur, and as for storage, it is just as important to treat the aluminum to prevent corrosion as it is to treat the steel water jackets to prevent rusting. It is therefore concluded that these problems should have very little influence in the choice of cylinder construction. Data at present available on various types of cylinder construction do not show power outputs in excess of those which have been actually obtained with the steel cylinder.

## An Airship Slide Rule

N.A.C.A. Report No. 160

Report No. 160 of the National Advisory Committee for Aeronautics, by E. R. Weaver and S. F. Pickering, describes an airship slide rule developed by the Gas-Chemistry Section of the Bureau of Standards, at the request of the Bureau of Engineering of the Navy Department. The development of this slide rule was requested by the Navy because of the successful results which had been reported of the Scott-Teed rule which had been developed and used by the British naval air service. It is intended primarily to give rapid solutions of a few problems of frequent occurance in airship navigation, but it can be used to advantage in solving a great variety of problems, involving volumes, lifting powers, temperatures, pressures, altitudes, and the purity of the balloon gas.

The rule is graduated to read directly in the units actually used in making observations, constants and conversion factors being taken care of by the length and location of the scales. In order to simplify as much as possible the manipulation of the rule, absolute accuracy has in some cases been sacrificed to convenience. Generally this has been necessary only in those cases in which the data upon which the computations will be based are not subject to accurate observation.

It is thought that with this rule practically any problem likely to arise in this class of work can be readily solved after the user has become familiar with the operation of the rule; and that the solution will in most cases, be as accurate as the data warrant.

A copy of Report No. 160 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

## Another Round the World Flight

A round the world flight is being planned for next spring by Capt. Sacadura Cabral and Admiral Gago Coutinho of the Portuguese navy, who achieved fame by their transatlantic flight from Lisbon to Rio de Janeiro. The two airmen plan to circle the globe in three different types of planes, each type being specially adapted to the conditions prevailing on the three main divisions of their projected itinerary: Lisbon-Japan, Japan-Newfoundland, and Newfoundland-Lisbon.

The total distance to be covered is approximately 19,500 nautical miles, and the main stopping points are Lisbon, Crete, Aleppo, Delhi, Calcutta, Rangoon, Bangkok, Shanghai, Yokohama, Petropavlovsk, Vancouver, Winnipeg, Quebec, the Azores, Lisbon.

# Air Service to Ask $25,000,000 Next Year

## Force of 2500 Planes Considered Vital for National Defense

By M. H. McINTYRE

Estimates approved by Maj. Gen. Mason M. Patrick for submission to Congress this fall provide for an appropriation of $25,000,000 for the Army Air Service next year, 1924-25.

Based on a report made by the War Plans Section after weeks of study and investigation, this appropriation is the minimum figure if the Air Force is to be maintained efficiently on its present "small and inadequate status", air officials say. Furthermore, the report shows that an equal amount must be provided the following year if the present force is to be kept from retrograding. Of the amount sought for the next fiscal year, $15,000,000 will be spent on new equipment and the remainder on general operating expenses.

If this amount, practically double the funds available this year, is made available, Congress will be told, it will be possible to bring the present force up to a high standard of efficiency and will pave the way for the eventual building up of an adequate peace time force. Similar annual appropriations of $25,000,000, it is estimated, will in a reasonable length of time increase the present small force to the strength that aviation experts believe will be sufficient to guarantee supremacy in the air as far as the defense of the country is concerned.

### *Equipment Situation Acute*

The increase sought this year is imperative, on account of the equipment situation which is fast becoming acute. Owing to the rapid deterioration of planes in service and the unavoidable number of crashes, the constant replacement program must go on uninterrupted.

For the past four years the government has been using for the most part war equipment, the new construction being confined largely to development of types. As a result, many aircraft concerns have been going out of business and the development of commercial aviation in the country, largely dependent on Army and Navy aviation, has been materially checked. Now that the war time supply rapidly nears exhaustion, it is conservatively estimated that, if present conditions continue, within two years there will be less than 300 available combat planes in the Army Air Service. Even at present there are only about 450 airplanes available for combat use, with almost a negligible number under construction—which is approximately one-fifth the number believed necessary for a peace time nucleus which could be speedily and effectively expanded to meet all the demands made on it in the event of war.

Compared to the 220 squadrons with 2000 machines that in the near future France will be able to mobilize immediately following a declaration of war and the home defense of fifty-two squadrons called for in the new program under way in England, making a total of 84 squadrons, the present force in the American army is woefully inadequate, in the expressed opinion of all responsible aviation heads.

### *Peace Strength of 2500 Planes*

As a result of the recent study the expert estimate that the maintenance of approximately 2500 airplanes in peace times will make available immediately upon the outbreak of hostilities of a force sufficiently strong to successfully play its part in the national defense. It is further estimated that a policy of keeping this number of planes available will place the airplane industry on such a status that the additional planes needed for war expansion of the service could be procured without any prolonged or costly delay.

The Air Service experts believe that this force of airplanes could be effectively operated by a peace time aviation corps with a personnel of about 4000 officers, 2500 flying cadets and 25,000 enlisted men. To build up and maintain this number of planes and the corps to operate them, it is estimated that a continuing appropriation of $25,000,000 annually will be needed. With this amount available it will be possible to construct gradually the necessary planes and at the same time maintain an efficient personnel, increasing as the number of airplanes grows, upon an efficient operating basis ready to meet any national emergency.

In working out mobilization plans that necessarily provide for the Air Force to be ready in case of trouble as the country's first line of defense, two great factors, the procurement of equipment and the training of personnel, have been taken into consideration. It takes nearly two years to develop properly, test and place in service any appreciable quantity of combat airplanes of a given type and the average period of time required to train flying officers during the world war was nine months.

### *Aerial Supremacy Vital*

In case of a national emergency in which great aerial hostilities might be expected from a hostile power it would be essential according to the experts, that a sufficiently large Air Force be available immediately to insure supremacy in the air for the United States in order to protect our vital coast points and industrial areas from bombardment. They point out that a continuation of the present appropriations will result in there being available for such an emergency only about two thirds as many combat planes as we have now.

The force immediately available in case of war must be used for offensive purposes in clearing the air of enemy aviation, carrying out bombardment and attack missions against hostile military objectives, reconnaissance and liaison with the artillery and other branches. It is obvious then, the experts say, that the United States Air Force under its present small organization will become practically a negligible factor in national defense unless immediate steps are taken to remedy the existing deficiencies by increased appropriations.

Another phase also is brought out in support of the request for larger appropriations this fall. In addition to the security from attack from the air an adequate air force would give, Congress will be told of the peace time uses of such a force that in themselves justify the expense of upbuilding and maintaining.

### *Peace Uses of Air Service*

Summed up by one of the officers who has been helping to work out the plans for the future upon which the recommendations to Congress are based, these peace uses are as follows:

"The Army Air Service in time of peace is working progressively to establish airways throughout the country, rendering assistance in the completion of other government projects, such as photographic mapping, spraying of vegetation pests such as the boll weevil, locating and spotting forest fires during the forest fire patrol season and many other projects involving rapid transportation.

"In spite of its small, inadequate force, it has fostered commercial aviation to the fullest extent. It established the Air Mail System for the Post Office Department. It has a long record of achievement in aeronautics, holding all the most important records of the world, including the high altitude record, high speed, endurance and long distance records as well as many speed records over intermediate distances.

"It has demonstrated the ease with which airplane communication may be established with Alaska, our northernmost possession and with the Virgin Islands, our most southeasterly possession. It has established airways within the continental United States between all the most important cities and has made non-stop flights from coast to coast and from the Gulf to the Lakes.

"A service with unlimited future possibilities, not only as a factor in national defense but in its commercial aspects which, in spite of being impeded by shortage of personnel and lack of equipment, should be fostered and encouraged and not repressed and hampered."

# Airplane Research Work through Flight Tests

## Wing Pressures on Thomas-Morse Pursuit Plane Measured In Flight by Multiple Manometer

To those interested in the development of aeronautics and the improvement in the design of high speed airplanes, the activities of the Army Air Service in conjunction with the National Advisory Committee for Aeronautics in making flight tests on the Thomas Morse MB3 airplane should be of especial interest.

While the static test of aircraft is of great value in determining the structural strength, certain limits are reached beyond which it is impossible to gather desired information. It has long been known that in flight airplanes are subject to stresses difficult of determination either by calculation or sand test. For this reason, after successful experiments on slower speed machines, the National Advisory Committee for Aeronautics was asked by officials of the Army Air Service to undertake tests to determine the lift distribution on the wings of a pursuit airplane at high speeds and in various maneuvers. Such tests were accordingly made at Langley Field with very interesting results.

Aside from the actual data obtained and its great usefulness in future design, it is gratifying to know that practical reresearch work is being carried on in these days when so much criticism is directed at the various aeronautical activities, and that the Army Air Service is making the utmost use of the facilities of the N.A.C.A. for furnishing scientific data which may be put to use at once.

In the following a brief description of the experiment and statement of the results will be found of value to those concerned in future design and constructional improvement of airplanes.

A Thomas Morse MB3 airplane was rebuilt so that from a large number of small holes made in both the upper and lower surfaces of the wings were connected by rubber tubes to a multiple manometer placed in the cockpit of the machine. As has been explained in various published reports, this multiple manometer is an ingenious device developed by the N.A.C.A. for showing and recording simultaneously the resultant pressure at several points on the wings of an airplane. When the pre-determined speed of the airplane has been reached the pilot starts the mechanism which continuously records on a photographic film the pressures at all of the various points. From this record may be read the upward, downward, or resultant pressures at any point on the wings during any maneuver, as well as the relation of the pressure at one point to that at another. From the records thus obtained, much interesting data has been made available; for example, it has been shown that the velocity of the slipstream has a very important bearing upon the wing pressures and that at relatively low speeds (below 115 m.p.h.) the pressure distribution on the right and left wings is not at all similar, but that as higher speeds are reached (145 to 150 m.p.h.) the pressure distribution on the right and left wings is nearly identical. In other words, when the airplane's velocity is increased the slipstream effect "washes out" and the lift on right and left wings is symmetrical.

The results obtained are shown in Fig. 1, which is a diagram of the wings with points of equal pressures connected into a line showing equal pressure distribution over the surface. This diagram, which shows the lift in steady flight at the comparatively low speed of 70 m.p.h., reveals the dissymmetrical action of the slipstream along the fuselage and permits to compare the pressure on the upper and lower wings of the airplane. On each aileron it will be noted, as

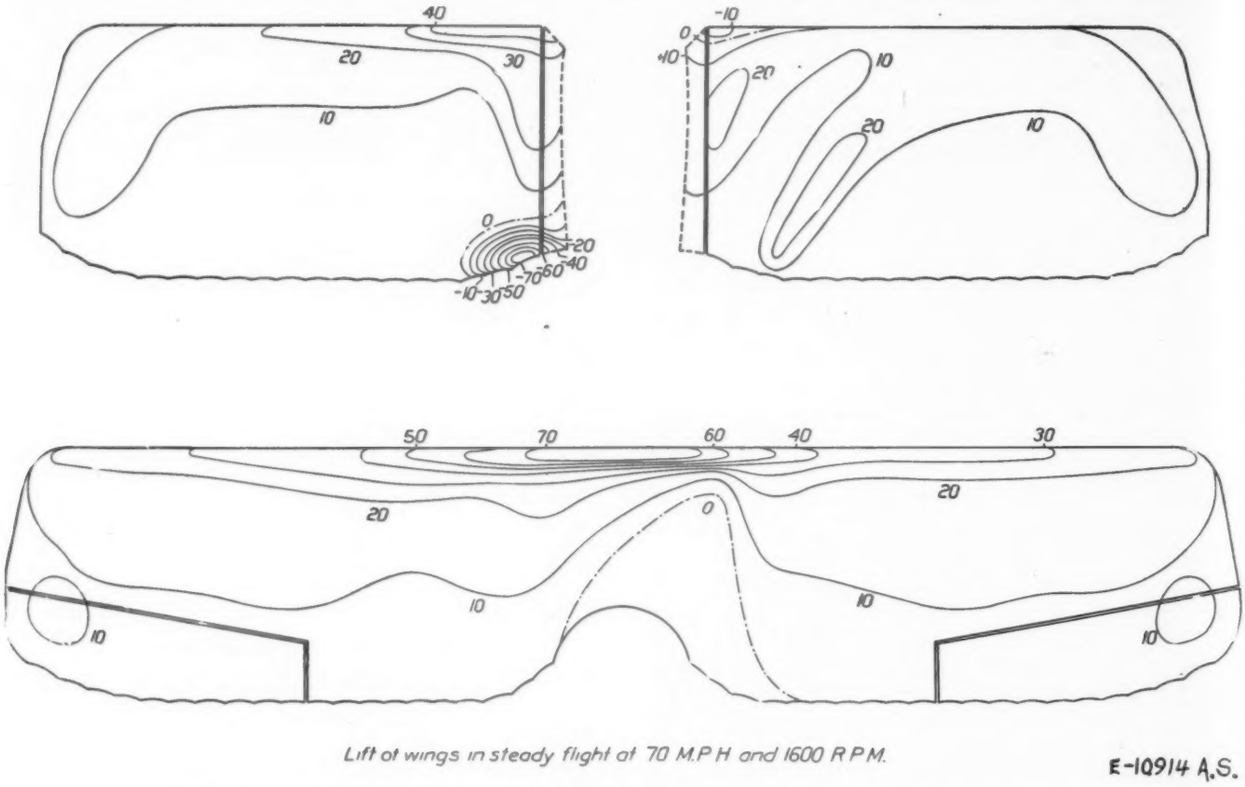



*Fig. 1. Pressure distribution over the lower and upper wings of a Thomas-Morse MB3 pursuit airplane in steady flight at low speed*

well as on the leading edges and outer ends of both wings, the pressure is relatively high. On the lower left wing at the trailing edge there is actually a resultant down pressure of a considerable amount.

The pressure distribution at high speed in a vertical bank

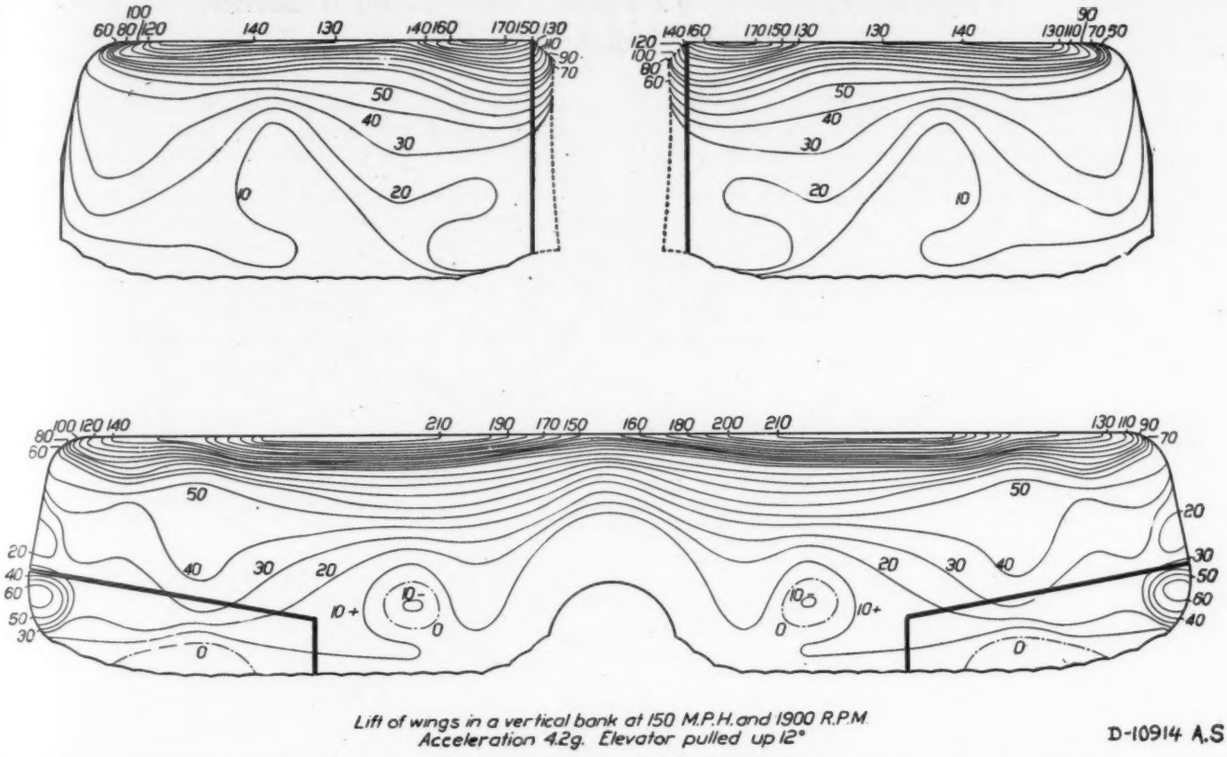



*Fig. 2. Pressure distribution over the lower and upper wings of a Thomas-Morse MB3 pursuit airplane in a high speed bank*

(150 m.p.h.) and acceleration of 4.2g is seen from Fig. 2 and 3 to have become practically identical on either side of the fuselage. An interesting feature to note from the high speed results is that the leading edges carry a very high proportion of the total lift of the wings. This would seem to indicate that the leading edge should be considerably reinforced and in fact possibly that in high speed craft metal or plywood should be employed in constructing the leading edges. Fabric will obviously not be strong enough. A study of the pressure distribution charts and models also probably indicates the

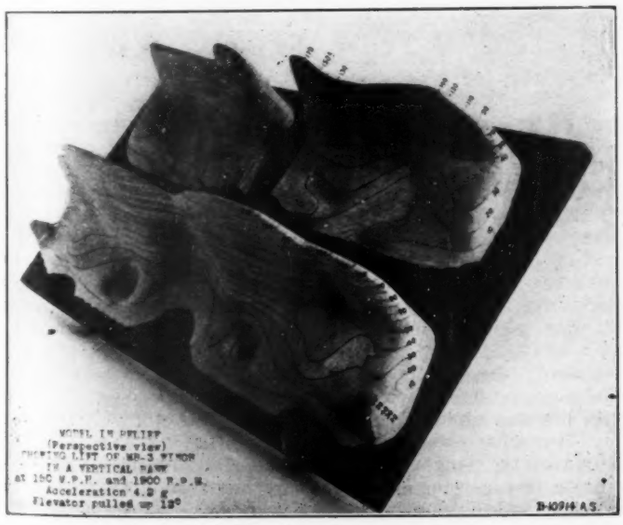



*Fig. 3. Model in relief showing pressure distribution over wings of MB3 airplane in a high speed turn*

reason why at high speeds failing of fabric has so frequently begun near leading edges and wing tips.

All together, briefly, the experiments show that there is very little relation between pressure distribution on an airplane at high and low speeds. There is shown where extra strength must be provided and possibly may also indicate where excessive weight may be eliminated.

Some of the most striking facts observed are:—

1. The lift in the slipstream during steady flight is far from uniform on this airplane; at high air-speed and high engine-speed a lift of 100 lb./sq. ft. was observed on the leading edge of the upper wing, while on the leading edge of the lower right wing there was an area of down pressure of 60 lb./sq. ft.

2. At low air-speed and high engine-speed, that is, while climbing, there was at the trailing edge of the lower left wing, near the fuselage, a down pressure of 70 lb./sq. ft.

3. When the suction on the upper surface of a wing was measured with reference to the air inside the wing, it was found to amount to as much as 76 lb./sq. ft. in steady flight, whereas in one isolated point an inward pressure of as much as 24 lb./sq. ft. was observed.

4. In flattening out of a dive the wings support only 80 per cent of the total load on the airplane, whereas in a vertically banked turn at 150 m.p.h. where the acceleration rose to 4.2 g. the wings carried 90 per cent of the load, the remainder being borne by the fuselage and tail surfaces.

5. In steady flight at 145 m.p.h. the lift per sq. ft. of the upper wing is twice that of the lower, the total lift of both wings being about 400 lb. greater than the weight of the airplane, balancing the down load on the fuselage and tail. This fact is, no doubt, due to the rigging of this particular airplane, that is, to the angular difference between the wings and to the lower wing being almost at zero lift.

It is not difficult to see the tremendous value and practical application of such information to the building of safer and more efficient pursuit craft. It is highly commendable that on the one hand delicate apparatus capable of making such measurements has been developed, and that on the other immediate use and application of the information so available has been made.

# Cannon and Machine Guns for Use on Aircraft

Prepared by Engineering Division, U. S. Army Air Service,
McCook Field, Dayton, Ohio

During the past three years, aircraft cannon have been developed for two uses, ground attack and combat. Development has been confined to 37 mm., 2.95 in., 75 mm., and 3 in., although other guns such as the Fiat 25.4 mm. and the Beehner 20 mm. are being experimented with. The Air Service is charged with development of mounts and sights for aircraft cannon of 37 mm. caliber or under. The Ordnance Department is charged with development of all aircraft cannon and with development of aircraft cannon mounts and sights for guns over 37 mm. caliber. A recent decision limits the development at present of cannon or cannon mounts for aircraft cannon with a caliber of 3 in.

### *Aircraft Cannon*

Combat cannon are being developed in two ways, for flexible use and for use as a fixed gun firing through the hollow propeller hub of especially designed engines.

The Baldwin 37 mm. automatic aircraft cannon was designed for both purposes and has been experimentally tested and found unsatisfactory. It was mounted in the nose of a Martin bomber and several hundred rounds were fired from this mount at targets on the ground. The gun was also mounted in the rear cockpit of a USD9A and fired from the air to determine its effect upon the flight of the airplane. From the results of the above tests, valuable information concerning the requirements for an aircraft cannon of this type was secured and the Ordnance Department is now developing cannon to meet these requirements. A 37 mm. semiautomatic cannon, to be mounted in an engine and to shoot through the hollow propeller hub was developed and 100 of these were built. An engine in which this cannon can be used has been under development for two years and a single-seater airplane has been built for this engine. This project is nearing completion and the airplane will be used for ground attack. This airplane also carries a fixed .50 caliber Browning gun. It is protected by armor around the engine, fuel system, pilot, and guns. Tests with explosive 37 mm. ammunition have demonstrated that one shot placed in the tail group or striking a spar or longeron will damage the airplane sufficiently to put it out of action.

A cannon-ring mount is being developed to carry a cannon on two-seater fighters for flexible use. The mount is operated electrically by maneuvering the gun in following the target.

Sights for flexible aircraft cannon are being developed experimentally to provide for greater accuracy at comparatively long ranges. The effectiveness of aircraft cannon for flexible use in combat depends upon its explosive projectile and accurate sighting at ranges longer than those in use with machine guns.

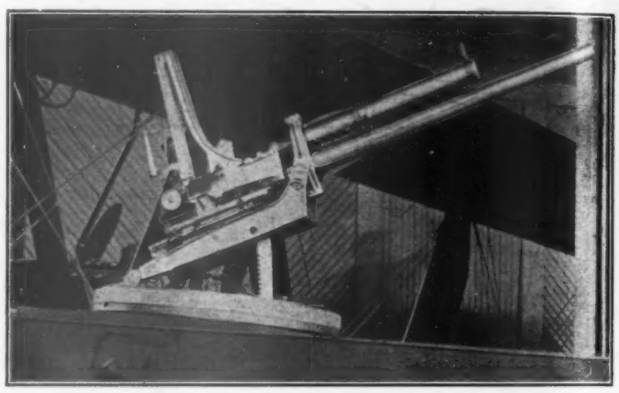
A 37 mm. semiautomatic cannon has recently been developed for flexible use in large ground attack airplanes carrying several machine guns and light bombs. Several of these guns will be mounted in existing airplanes of the above type for service test.

A modified 2.95 in. mountain gun was experimentally mounted in a Martin bomber for bombardment fire at targets on the ground and considerable firing was done from the air. This gun proved to be undesirable because of its excessive weight, lack of sufficient maneuverability and excessive blast pressure.

A 3 in. Davis nonrecoil gun was mounted in the nose of a Martin bomber to fire at targets on the ground. Very satisfactory results were secured with this type of gun at altitudes below 2000 ft. with fixed bead sights. The gun fires a 15 lb. projectile from a case containing a primer placed in its side. The powder charge separates the projectile in one end of the case and a charge of buckshot and cosmoline in the other end of the case. When the powder explodes, its pressure is exerted equally on the projectile and on the charge of buckshot. The gun consists of a tube which may be separated near its center for removing the empty case and reloading. The projectile and charge of buckshot leaves the gun at opposite ends with equal energy, thus eliminating any recoil force on the gun mount. It is necessary to limit the angles of fire to prevent damage to the airplane from the charge of buckshot. This gun is being mounted in the rear cockpit of a Martin bomber at present and it is planned to conduct extensive tests with this gun.

### *Synchronizers*

The standard synchronizer at present is known as the Nelson gun control. This synchronizer was developed during the last war to replace the C C interrupter gear and to make possible the firing of synchronized guns at all engine speeds. This synchronizer (Nelson) differs from the C C in that an impulse from the synchronizer is required to fire each shot. To insure this action, all machine guns used as synchronized guns have been changed to single-shot action. The Nelson gun control consists of a two-humped cam rotated at propeller



*37 mm. semi-automatic cannon, developed for flexible use on ground attack airplanes*

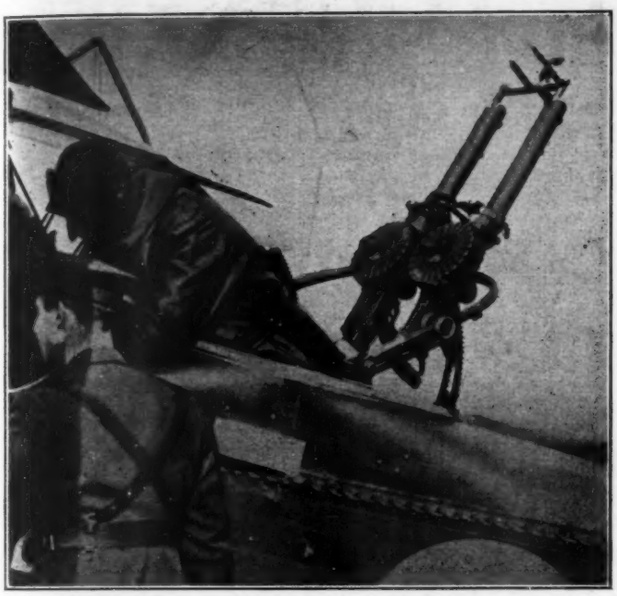
speed actuating a rocker arm which transmits impulses to the gun-trigger motor through a wire. The connections are mechanical throughout, moving parts are very light, gearing is definite, and there is no back lash or play in the system. It is reliable and maintenance is practically negligible. Due to a number of braces which are required and to the necessity of direct connections between the synchronizer generator and the gun, it is very difficult to design satisfactory installations. This has led to the development of more flexible types of synchronizers.

Experiments with using a wire operating in a metal tube, containing several bends were conducted successfully and a modification of the Nelson gun control, incorporating this feature, will be built for service test. This modification permits the airplane designer to locate the synchronized guns in a more advantageous position for the pilot.

Development of an electrical synchronizer has been in progress for several years. The advantages to be gained by use of an electrical synchronizer consist of increased flexibility in the locations of synchronized guns and the increased ease in designing synchronized gun installations. An electrical synchronizer, which meets synchronizing requirements, was recently experimentally tested and is being built in a small quantity for service test. This synchronizer is about twice as heavy as the Nelson gun control and, although it is capable of satisfactory synchronization through a wider range of propeller speeds than the Nelson gun control, further development is being undertaken to lighten it and to provide for

its more general use. As built at present, it requires a particularly light trigger pull in the gun. This requires a slight modification in existing guns.

An investigation of German synchronizers was made and development of a flexible shaft synchronizer was started. The German synchronizer consisted of a flexible shaft which was operated only when the gun was fired. This required a very strong shaft to withstand twisting stresses induced by suddenly starting the shaft at high engine speed. In the present development in this country, the shaft is rotated continuously and the trigger-motor mechanism is actuated only when it is desired to fire the gun. This development is still in the early stages, but its successful conclusion is probable. It should provide flexibility in installation and should be lighter than the Nelson gun control.



*Twin Lewis guns mounted on a Scarff ring for flexible use*

In order to provide increased safety in the use of the Nelson gun control with four-bladed propellers at high engine speeds, an automatic advance is being developed for application in the cam shaft to automatically advance the time of fire of the gun with respect to the position of the propeller blades as the speed of the propeller increases. One model was built and successfully tested. A second model is being built to reduce the weight and permit its use on all installations.

A new type of synchronizer is being developed to include many of the successful features of other types. Out of the different lines of development it is hoped that a synchronizer will result which will overcome the difficulties of those in use at present. The use of larger caliber guns with slower burning powder charge has increased the synchronizing difficulties in addition to the increased efficiency necessitated by use of four-bladed propellers and engines with a higher speed range.

### *Machine Guns, Mounts and Sights*

Following the first use of firearms, in flight, when pistol duels between pilots, and shot-guns between observers, were more spectacular than effective, the first machine guns were mounted upon the upper wing, sometimes at an angle, to miss the propeller. It is often proposed that the pilot be provided with a flexibly mounted gun, but this idea was early abandoned, because the attention of the pilot can not be divided in that manner between handling a flexible gun and aiming in one direction while flying in some other direction; moreover the pursuit pilot can more quickly shift and aim the whole airplane, than shift and aim the gun by moving about in the cockpit.

While both sides were literally firing through the propellers, using metal sheathing to deflect the bullets that hit it, the Germans came out with a timing gear, which fired a fixed gun, when the propeller blades were not in line of fire. The French Spad synchronizing gear is an example of the improvement then effected, in interrupting the gun-fire when the propeller blades were in line of fire, through a certain dead arc, to allow for slow bullets and for a varying engine speed range. The English Constantinesco oil transmission gear was an ingenious device, but never satisfactorily took the place of mechanical connections. Development in this line has been to eliminate as many joints as possible which by wear permit a delayed fire to occur.

The early flexible gun mounts were cumbersome and limited in arc of fire. From the French turrets of double bow construction, the British developed the simpler and lighter Scarff mount which the French modified and the allies used universally.

While the Germans cut V-shaped holes through the fuselage of large machines, permitting the top turret guns to fire down through, the French first mounted an extra floor gun whose fire could be quite effectively guided by viewing tracer bullets without sights, but floor guns are more effectively handled now by linkages to an upper control lever by which the gunner can shift the floor gun from a standing position and see the tracers with more adequate vision over the outside of the fuselage.

The tendency is now to design the airplanes to permit the greatest possible arcs of fire of all flexible guns and to improve the mounts to permit ease of handling.

### *Post-War Developments*

For pursuit attack, since the war, the .30 cal. Vickers, Marlin, and Browning machine guns have been adapted for right or left hand feed, and attention has been paid in airplane design for interchangeable mounts, including the .50 cal. Browning and 11 mm. and .50 cal. Vickers.

The following paragraphs will indicate the lines along which armament development has proceeded since the war.

While the development of machine guns and cannon comes under the supervision of the Ordnance Department, their installation brings up many problems which the Engineering Division must pass upon as well as the development, or recommendations for development, of various accessories.

An automatic cocking attachment, which was designed for the .30 cal. Browning machine gun, to automatically recock the gun in case of a stoppage in a remotely controlled installation, failed to function due to the fact that although the recoil of the gun was sufficient to cock the rear charging spring, it would not function in practice due to friction. This is under further development.

A new spade grip has been designed for the .30 cal. Browning gun with a thumb-pressure trigger on the top, which connects with the Browning trigger at the bottom, permitting the use of this gun flexibly mounted, as in the Scarff turret in place of the Lewis machine gun.

To use the Browning gun in this manner, special belt-feed magazines have been devised, which are attached to the gun. One form of hopper is an inverted U box which straddles the gun and may be readily changed for another box. A second form comprises a reel taking about a 350 round belt. This reel is slipped into a frame attached to the gun so as to lie flat against the left hand face of the gun, offering small wind resistance and obstruction to vision. The belt is fed around a short warped chute into the feedway, and the chute is left open enough to readily permit starting the belt in the feedway pawls. The latter form has been made in a fork type, suitable for replacing the Lewis gun in a turret, and also in a universal gimbal frame designed for mounting in a floor tunnel, or in some location remote from the gunner, as for example in the tail of an airplane. This mount is provided with locks on both vertical and horizontal axes of rotation, which leave the gun rigidly fixed in any position until the gunner pulls flexible cable connections which unlock and rotate the gun. The cables are attached to a control lever so that the gun parallels the movement of the control lever.

A double Browning floor mount is also in design which permits 2400 shots to be fired per minute for ground attack work by a rear gunner's direct hold of the grip for aiming in any direction.

# INTERNATIONA

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| 4. | Tuesday, Oct. 2—Light Commercial Handicap (200 H. P. or less) for Aviation Country Club of Detroit Trophy | Civilians Only | $2,000 |
| 5. | Tuesday, Oct. 2—Large Capacity Planes for Merchants Exchange of St. Louis Trophy | Civilian and Military | $2,000 |
| 6. | Tuesday, Oct. 2—Model Race for Mulvihill Trophy | Members Junior Flying League, National Aeronautic Association | $ 300 |
| 7. | Wednesday, Oct. 3—Air Mail Planes for Detroit News Air Mail Trophy | U. S. Air Mail Pilots | $1,500 |
| 8. | Wednesday, Oct. 3—High Speed Planes for Pulitzer Trophy | Civilian and Military | $4,000 |

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Attempt is also being made to feed a Browning gun by a hopper of ammunition without the use of a belt, and it is believed the difficulties in obtaining even feed, due to the taper of the shells, can be overcome.

A new turret has been tested which is intended to provide greater flexibility in shifting both laterally, around the gunner, and in elevation. This is operated by a single control lever on a sort of stick control principle, so that the first pressure upon the lever in either direction of shift unlocks the turret ring or the bow support in the desired direction. The bow support also swings the gun or guns further down over the sides of the fuselage than our present standard type A ring mount to eliminate all dead arc of fire underneath.

The .50 cal. Browning gun is likewise being adapted for flexible mounting, by supplying a suitable ammunition box and feed. A new turret is necessary to counterbalance the increased weight of this gun to stand the increased recoil, and to provide the flexibility of movement without encroaching too much in any position upon the gunner's room, for which a new linkage has been worked out.

The wind pressure against twin Lewis guns broadside to the slipstream has been found to be about 80 lb. in a DH, and to facilitate the gunner in shifting the turret against that wind pressure a wind compensator has been devised consisting of a spring-operated piston and small train of gears in an aluminum housing fastened across a chord of the revolving ring of the turret, acting against a gear on the base ring. This device does not supply motive force for turning the turret, but by a special cam, counterbalances the wind pressure in all angular positions of the revolving ring, so that the gunner has to exert a force of not over 15 lb. in any postion, instead of 80. This device, incorporated with the type A ring mount, is known as type C ring mount.

For the Lewis gun, a duplex trigger control has been tested which employs a shaft cross connection to eliminate Bowden cable for operating the triggers of twin guns from one grip.

It has been found that the Lewis gun will not satisfactorily operate a drum of much more than the present 97-round capacity, while the Browning will feed a 350 round belt and larger. For this reason, and because the Browning feed is somewhat more positive and the gun more rugged, it is believed that the Browning will largely supplant the Lewis for flexible use.

The twin Lewis yoke which was used throughout the war, permitted awkward movement of the guns about the turret bow support, and this defect has been eliminated in one which is freer in movement, and retains the balance of the guns in all positions.

While the ring sight is still standard for use on fixed synchronized guns, and the wind vane sight in addition for flexible guns, to correct for gunner's speed, work is being done to improve the telescopic sight for fixed guns and to improve wind vane sights as well.

A smaller edition of the Aldis telescopic sight is being provided with an illuminating device which, for night use, will illuminate the reticle without hampering vision, in which the intensity of light may be adjusted by moving the source of illumination in relation to a slot above the reticle.

In place of changing of ring sights of fixed diameter according to the enemy speeds assumed, a sight has been perfected by which the gunner can change the diameter to a scale of speeds in flight if desired. Whereas wind vane sights have heretofore been made for one assumed airplane speed, a new one is provided with an arm adjustable to a speed scale suitable for use on different speed airplanes or for adjustment to different flying speeds.

An improved form of Reille-Soult wind vane sight is also being tested out in which the adjustment is obtained by sliding the sight fore and aft on a bar mount.

For use on cannon, in locations where the actual windage may not always be in line of flight and hence cause erratic wobbling of a wind vane sight, a mechanical linkage with the gun's axes of rotation has been tested and is being redesigned to eliminate the use of gearing originally used.

A further development in sights is in progress, by which the accuracy is expected to be such as to warrant firing machine guns or cannon at ranges greatly in excess of those which were effective during the war. At ranges up to one or two thousand feet, the fall of the trajectories and their deviation due to windage and the angle of fire off line of flight, become so great as to necessitate correction for them, whereas at 200 yd. or less, a straight line average has been used without serious error. The new sight makes correction for both enemy and gunner's speeds, and effects automatic offset of the line of sight, horizontally and vertically, by the process of following the objective with the gun.

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# Glorified African Golf

(c) International Newsreel

*"Aero dice"—the latest American sport, which originated in Los Angeles. The dice are rolled by placing them in the slipstream of the propeller and starting the engine. The dice are then collected by hand*

## Navy Entries in Schneider Race

Two of the four Navy planes that are to represent this country in the Schneider Cup Seaplane Race to be held at Cowes, England, Sept. 28, were tested Monday, July 23. One of the ships, the NW2 plane was tested at the Naval Aircraft Factory, Philadelphia, while the other, the CR3, was tested at Port Washington, L. I.

The CR3 is an adoption of the Curtiss-Navy Racer which has been standard design for racing and has led the world in performance since the first of the type won the 1921 Pulitzer Race. This type forms the basis of a fleet of Navy fighting planes which the Navy would place in the air in the eventuality of war.

The NW type is a small biplane powered with a Wright T2 engine of 700 hp. and is the highest powered single-engined seaplane ever built. The first plane of this type was entered in the Pulitzer Race last year as the "Mystery Ship". At that time she was a new development with an engine which had never been in the air before. She was practically taken from the shed and sent into the air in the race. In the last year she has been improved and redesigned in many particulars, which adapt her to Navy needs not only as a racing plane but as a basis for the development of swift fighting planes.

France, Italy and England are bending every effort and are going to limits of design never before attempted in an endeavor to turn out seaworthy types of fast seaplanes capable of competing with those of the United States Navy. The race, at Cowes will epitomize the larger competition in air strength that has attracted so much international attention in the last few months.

The types of aircraft which will represent the United States Navy in this event and which are viewed with such keen interest on the part of international competitors will demonstrate that although the United States has not declared itself as a participant in the race for the supremacy in the air, nevertheless those charged with the development of Naval Aeronautics are fully abreast of world progress in this important development and are ready to expand on a basis of design superior to any in the world.

Although every confidence is felt that the Navy representatives will give a good account of themselves, the result is by no means a certainty. It is known that England is making strenuous efforts to insure that the prestige that attaches to the winning of this aerial classic will not be wrested from her. While Italy, who lost to England the Schneider Cup Race last year after having won it two years in succession, can be counted upon to be a formidable contender.

The Navy entries are made up of the following pilots and planes:

*Pilots.* Lieut. F. W. Wead, U.S.N., in charge; Lieut. Rutledge Irvine, U.S.N.; Lieut. A. W. Gorton, U.S.N.; Lieut. D. Rittenhouse, U.S.N.

*Planes.* One NW2, two CR3 and one TR3.

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## Book Reviews

ALL THE WORLD'S AIRCRAFT, 1923. By C. G. Grey, Editor, *The Aeroplane.* 435 pp., 611 ill., 129 scale dwgs. (Sampson Low, Marston & Co., London.)

This well known annual, which has come to be accepted as the standard reference work on the world's aeronautical progress, has just been issued for the year 1923, which makes its thirteenth year of issue.

The general arrangement of the reading matter follows the scheme adopted last year whereby it is divided into (1) a Historical Section, dealing with the development of Military and Civil Aviation; (2) an Airplane Section, giving particulars of the latest heavier-than-air craft, and including gliders and helicopters as well; (3) an Aero Engine Section; and (4) an Airship Section. Information on aircraft carriers is, for the first time, included in the section devoted to the world's air forces.

Those who have followed the evolution of "All the World's Aircraft" from its beginnings will have noticed its steady improvement from year to year. The latest issue is no exception to this rule. All aircraft that have become obsolete or are no longer in current use have been deleted, so that the machines described are nearly all of 1922-23 production. The descriptions of aircraft are accompanied by a large number of generally excellent photographs and, frequently, scale drawings as well, which greatly enhance the value of the work from the viewpoint of the aircraft designer and all those concerned with aeronautical progress.

Considering the manifold difficulties which have to be overcome in a compilation of this kind, the editor of "All the World's Aircraft, 1923" is to be congratulated upon the inclusiveness and variety of this work.

REPORTS OF RIJKS-STUDIEDIENST VOOR DE LUCHTVAART (Government Aerodynamic Institute, Amsterdam, Netherlands.)

Report No. 29 of the R.S.L. describes experiments made with an airplane model consisting of a thick wing and a Fokker F3 fuselage to obtain data on the influence of a cut-out in the central portion of the leading edge. It is shown that the cut-out should be made as small as possible on account of the detrimental influence of the aerodynamic properties of the airplane.

R.S.L. Report No. 51 describes scale model experiments with a device for shortening the landing run and glide of an airplane. This device consists of a number of flaps which during normal flight lie flat against the wing or can be drawn into the latter, and which can be raised to increase the drag and so bring about a braking effect. The experiments show that with this device the landing run can be reduced 30 per cent, and that the glide can be shortened by 54 per cent.

LE BALLON ET L'AVION. By Maurice Larrouy. 215 pp., 25 ill. (Librairie Armand Colin, Paris, France.)

This book of pocket size is written for the educated layman who desires to acquire more than a superficial though not a professional knowledge of the why and wherefore of aerial navigation. Considering the necessary limitations of this concept, the book is remarkably comprehensive in its scope and its exposition has that clarity which characterises the best French thought.

M. Larrouy is a reserve lieutenant in the French Navy, an airship pilot and an aeronautical engineer who graduated from Ecole Supérieure d'Aéronautique of Paris. He therefore possesses unusual qualifications for writing a book of this kind. The reading matter deals with such varied subjects as static and dynamic sustentation, airplane and airship construction, aerial navigation, power flight, orientation, etc.

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## French Light Plane Race

The light plane competition for the 125,000 francs prize offered by the Paris daily *Le Petit Parisien* was held July 15, last, at Buc airdrome, near Paris, and was won by a Farman plane piloted by Lucien Coupet.

The preliminary conditions of the contest were as follows: (1) a weight limit of 250 kilograms for single-seaters, and 320 kilograms for two-seaters; (2) a safety factor of 3, to be determined in static tests; (3) a fuel allowance of 20 kilograms; (4) an initial climb of 500 meters in 30 min. The final competition consisted of a race around a diamond shaped 10 kilometer course which the contestants had to cover at least thirty times. Failure to cover the 300 kilometers distance eliminated a contestant, and first prize was to be awarded the contestant who covered the greatest number of laps in excess of thirty.

Seven light planes, or "moto-aviettes", entered this contest, including three Dewoitines, three Farmans, and one Breguet. All were single-seaters. The winning Farman, piloted by Coupet, averaged a speed of 64 km. p. h. and was the only contestant to complete the race. One of the Dewoitine planes, piloted by Georges Barbot, dropped out owing to engine trouble in the 28th lap, when he was leading, while the other two Dewoitines withdrew in the 19th and 15th laps, respectively.

The second Farman and the Breguet dropped out in the fourth lap, and the third Farman in the third lap.

# AIRPORTS AND AIRWAYS

*This Department is concerned with all civil flying activities such as the establishment of airports, the marking of airways, warnings to airmen regarding obstructions, experiences gathered on flying routes and landing fields, the work of commercial aviation companies and private fliers, the formation of new air transport enterprises, personal paragraphs of general interest, etc.*

*Communications to this effect, addressed "Airways Editor, Aviation, 225 Fourth Ave., New York City", should be brief, accurate and to the point. They should deal with facts, not with theories or speculations. While American civil flying activities will naturally be given prominence, communications will also be welcomed from Canada, Mexico and other parts of the Western Hemisphere.* EDITOR.

### First Chicago-New York Night Flight

The first night flight between Chicago and New York—and a non-stop one, at that—was accomplished July 26-27 by Eddie Stinson, flying a JL6 cabin monoplane, and carrying as passengers Charles Dickinson, president of the Aero Club of Illinois, and Arthur Gray, mechanic.

The airmen took off Thursday at 11 p. m. central time (midnight, eastern standard time) and landed at Curtiss Field, Garden City, L. I., at 7.30 a. m. the following morning. Their average speed for the distance of 750 miles is approximately 88 m.p.h. A full moon helped them as far as Cleveland, which was sighted at 2.29 a. m. There the moon was obscured by clouds, and from then on they flew in total darkness until well over Pennsylvania, when daylight broke. Mr. Dickinson said on landing that he frequently dozed during the flight and that he had as comfortable a trip as he would have had in a sleeping car. The trip was made for the purpose of demonstrating the practicability of overnight air traffic between New York and Chicago.

### U. S. Round the World Flight

Six planes of the Transport type, fitted with a single Liberty engine, which are now under construction in the L.W.F. plant at College Point, L. I., are to be used in the round the world flight attempt by the Army Air Service, according to the New York *World*.

Contrary to previous prospects, the flight will be made from East to West, starting from New York, proceeding by way of New Foundland, Greenland, Iceland, England and across France to the Mediterranean, then the course will be the usual British route over Mesopotamia and India, thence by way of Bangkok (capital of Siam) to Huy and Saigon in Indo-China. The planes then would follow the China coast to Hongkong and Tokyo, returning across the Pacific by way of the Kurile Islands, the Aleutians and Alaska.

It is estimated the flight can be made in less than two months. Depots with supplies, etc., would be established about every 400 miles. Though the flight has not yet received final authorization no doubt exists that it will be approved.

### Britain Resumes Airship Construction

Construction of airships, which has stopped in Great Britain for the last four years, is to be resumed forthwith, according to a decision of the Royal Air Force. Following the lead of the United States, Great Britain will lay down a plane-carrying airship of the rigid type which is to carry a squadron of pursuit planes.

Sir Samuel Hoare, British air minister, also announced in the House of Commons on July 26 that the British government had decided to resume development of airships, and to proceed, if possible, by means of a commercial service rather than by State operation. He stated that the Committee of Imperial Defense attached considerable strategic value to airships, while the Imperial Shipping Committee considered that it was by means of airship service that the carriage of mails could most cheaply be expedited to the Far East and Australia.

Proposals have been put before the Government by Commander Burney, from which a bi-weekly service of six large airships to India would eventually set up that scheme, and this has been accepted in principle by the Government, subject to details of the contract being satisfactorily settled by the Treasury.

The Dominions are being informed of this decision, and it is hoped to discuss the question at the Imperial Conference, with a view to their co-operation in the scheme.

### Resolutions of Air Congress

The International Air Congress which held its sessions in London, adopted a series of resolutions of prime importance to the world of aviation. These included:

A request to the International Commission on Air Navigation to evolve some uniform scheme of posting the weather forecasts in all airports, and of compiling a leaflet of essential information for pilots.

The recommendation that an international conference should be held as soon as possible, with delegates appointed by their respective Governments, to study and define the general principles of private international law relating to the air, and to submit propositions of law for ratification by the various nations concerned.

An invitation to the international commission for the standardization of aircraft materials and component parts; and an invitation to the postal authorities of the various European Governments to devise air transport time-tables which would best suit them for the carriage of mails.

The pooling and comparison of results of experiments in all aerodynamic laboratories was also recommended, and the respective Governments were urged, in the interests of aerial navigation, to unite in subsidizing the trans-continental air services as speedily as possible. The medical section of the congress affirmed that from the evidence now accumulated, the physical conditions of pilots who have flown for years, given reasonable flying hours, does not deteriorate more rapidly than in other employments, and that the data and curves already available indicate that those pilots maintain a condition above the normal for their age.

### Handley Page on Air Transport

At the International Air Congress recently held in London, F. Handley Page, the aircraft constructor, speaking on the subject of commercial aviation, criticized present day planes, saying that the aim seemed to be to crowd as many people into the smallest space possible with disregard for the safety of passengers.

Within the near future he expected seaplanes would be developed capable of carrying one hundred passengers and able to fly off the decks of ocean liners before they landed, thus saving two days' transatlantic passage.

### C. B. D. Collyer with Skywriters

The lure of skywriting has just deprived the U. S. Air Mail Service of one of its most popular pilots in the person of C. B. D. Collyer, who has joined the flying staff of the Skywriting Corp. of America.

Pilot Collyer will operate in the Middle-West, with headquarters at Minneapolis, and later in the Southwest. His numerous friends will wish him luck in his new enterprise.

## Columbus Airport Inaugurated

Norton Field, the airport of Columbus, Ohio, was officially dedicated and opened June 30. The airport is named in honor of First Lieut. Fred W. Norton, of the 27th Aero Sqn., A.E.F. who was killed in action over the French lines in 1918.

Impressive ceremonies, among which was the unveiling of a tablet in memory of Lieutenant Norton, marked the dedication which was attended by many notable figures of the aviation world and some 8000 spectators, a number of whom came by air. Visiting airplanes numbered thirty, and included Army, Air Mail and civilian ships.

The first ship to land was that of Maj. Maxwell Kirby, air officer at Fort Hayes, who arrived at noon from Washington, D. C. From then on until 2 p. m., when the dedication ceremonies started, seventeen planes landed at Norton Field, while twelve more arrived in the course of the afternoon. Among these was a five plane formation from Wilbur Wright Field, Fairfield, Ohio, commanded by Maj. H. J. Knerr, A.S., which was followed by Capt. G. E. Brower and Lieutenant Sutton, A.S. leading a DH squadron from McCook Field, Dayton, and a Martin Bomber. Capt. Edward Rickenbacker who was to speak at the dedication was delayed by a forced landing at Marion, Ohio, but a relief plane sent out from Norton Field landed him in time to address the crowd before the ceremonies were over.

The opening of the ceremonies was signaled by an airplane which dropped a bomb, whereupon Col. Edward Orton, jr.

*Memorial tablet to Lieut. Fred W. Norton, A. S., which was unveiled at the dedication of Norton Field, Columbus, Ohio, June 30, 1923*

gave an outline of the successful efforts after many years of hope and of striving on the part of the Aero Club of Columbus, the local Chamber of Commerce and other organizations to establish an airport at Columbus. Lt. Col. Frank A. Hunter, a member of the Fred Norton Post of the American Legion, then extolled the virtues of the dead hero. Father John J. Sullivan who conducted the services of Norton in France, then paid a moving tribute to the heroism of a man who, he said, he had known and constantly admired. At the close of his address the flag was looped back from the granite block holding the commemorative bronze tablet and disclosed engraved on it under Norton's name his last words sent as a message to his commanding officer: "More power to you. Carry on."

During Father Sullivan's address five Air Mail ships from Cleveland thundered through the air directly above the stand at exactly 2:30 p. m., reaching there to the minute as prearranged. Gen. James H. McCrae, commandant of Fort Hayes then formally accepted the flying field in the name of the United States Army. The mail planes delivered a consignment of mail to Postmaster Fred Tibbets, who carried it to the speaker's stand and presented to Mayor James J. Thomas of Columbus a congratulatory message from the Chamber of Commerce of Cleveland, which was read from the stand.

Speeches were then made by Governor Vic Donahue, who accepted the field in the name of the people of Ohio; by Mayor Thomas, who traced the rapid development of Columbus to this new peak of transportation and predicted its future impetus would be a great factor in the development of the city; and by Lt. Col. Harold E. Hartney, who commanded the First Pursuit Group, A.E.F. in France, who recalled in a stirring address some personal reminiscences of the dead aviator.

"I do not think," Colonel Hartney said, 'that there was any greater hero in the American air service overseas than Fred W. Norton. He was my senior flight commander and my closest friend and advisor. Just five years ago today I remember him departing across the Chateau Thierry front, leading the 27th air squadron into action, at the head of eight planes.

"Then on July 2, with eight other planes he went out to meet the enemy and plunged into the famed Richthofen circus, the dreaded crack air squadron of the German army. Nothing that can be said of Fred Norton could better exemplify his character and his courage and his ability as a soldier and a flight commander than his admirable heroism in sticking in that fight, with the noted German host, when both of his guns jammed.

"He told me afterward that he thought of the boys in the trenches and of his responsibility to them. He attacked the cream of the German air force and that was the cream of the whole German army. It is noteworthy indeed that the only thing which General Ludendorff thought worth mentioning in his communique for that day was that air fight. He wrote in that communique, we met a flight of nine American pilots and had a bad fight!"

"My memory of the last time I saw Fred Norton was of his waving goodbye as he set out on the voluntary mission from which he never returned."

A few minutes after the end of his speech the plane sent after Eddie Rickenbacker brought him to the field. He was cheered as he climbed out of the plane and was escorted en masse to the speaker's stand where he spoke briefly, recounted his troubles in Marion where, he ran out of gasoline and had magneto trouble later, having to abandon any thought of bringing the plane through. He spoke of Fred Norton as "a fine soldier and a good friend," adding, in a few sentences, one of the most stirring eulogies of the day.

After Rickenbacker's talk, announcement was made that the stunt flying, aerobatic maneuvers, passenger carrying would close the ceremonies. The huge crowd stayed, almost in a body, for these events and were treated to a veritable circus of trick performances.

Among the notable visitors attending the ceremonies, beside those who spoke were Glenn Martin, the aircraft constructor, who with L. L. Boyer represented the National Aeronautic Association, and A.H. Bowman, of Louisville, for whom the new aviation field there has been named.

No accidents of any kind occurred to mar the afternoon.

The day's events were officially closed with a reception and dance at Fort Hayes in honor of the visiting aviators from McCook and Wilbur Wright fields, and Army officers from those places and from others, who were guests of the day.

## Cumberland, Md., Gets Municipal Field

Word has been received from Cumberland that the Aviation Committee of the Cumberland Chamber of Commerce has after two years of endeavor secured an adequate landing field which has the approval of the Army Air Service.

A. H. Amick, Jr., Chairman of the Aviation Committee and member of the N.A.A., has been largely responsible for its establishment and reports the field as comprising 85 acres of level bottom land, suitable for all types of aircraft.

Cumberland is on the Dayton to Washington Model Airway of the Army Air Service.

## New Chicago Airport Suggested

A new airport for Chicago, to be situated in the uptown section, is suggested by Otto Klein, aviation editor of the *Uptown Chicago Times*. He writes:

"It is today a recognized fact that Chicago, due to its favorable geographic location, is destined to become America's air center. Plans have already been considered to provide a large municipal flying field by extending Grant park to the inner breakwater. A field of such immensity, from the Illinois Central railroad a mile or so east and from Randolph street in the north to the Field museum on the south, would, indeed, be a flying field worthy of the city and the great commercial air traffic eventually centering here.

"But filling in the inner harbor, as proposed, is a task requiring a decade to complete, and Chicago, to keep pace with the world, needs a municipal airport right now! While our city fathers are "proposing" Uptown Chicago can be "doing." Uptown Chicago can have a wonderful combined land and water airport, and can have it at surprisingly low cost and can—and should—have it now, this summer.

"According to the lay-out of the future Lincoln Park improvements the filling-in is to continue to Devon avenue, a narrow lagoon to be provided along the present shore line widened here and there to disrupt the monotony of the landscape. So far, the work of filling-in has progressed to a few feet north of Irving Park boulevard, each block consuming some two years of costly time. The question now arises what public use the last few blocks of the reclaimed land are to be put to, and the decision, so far, seems to waver between a flying field and golf course.

"The first step to be taken would be to grade the land from Waveland avenue north as far as it has been filled in. This would allow land planes to operate in all directions save west.

"While the field is being used the filling-in process should continue north to Bittersweet place, one block north of Irving Park boulevard. At the same time the breakwater, now ending off Bittersweet place, should be extended as quickly as possible and preferably to Lawrence avenue, with an opening at some intermediate point. This breakwater, which could be completed in a very short time, would provide a safe landing place for flying boats, thus making the airport a combined land and water port. These developments require so little labor that by the end of summer all details could be completed, whereas were the proposed park improvements to be carried out, they would take years."

## Bapt Expedition Off

The French round-the-world flight expedition originally known as the Bapt Flying Circus has been called off after various mishaps befell the members of the party. The expedition originally consisted of five pilots and five mechanics under Capt. Georges Madon, with three Gourdou-Leseurre single-seater pursuit ships, one Spad S42 two-seater touring plane and a S46 four-passenger cabin plane.

The Flying Circus was organized under the patronage of the French Air Department for the purpose of giving public demonstration of modern French aircraft on a world circling tour which was to take the expedition from France through Asia to the Far East, from there to North and South America, and return thence to France by way of Africa. Starting April 15 from Nice, France, the expedition successively reached Milan, Rome and Palermo, Italy, giving at each named place a flying meeting which attracted large crowds and in which Italian aviators participated. On May 23, while en route from Palermo, Sicily, to Tunis, North Africa, Captain Madon flying one of the pursuit ships had engine failure over the Mediterranean Sea and came down safely on the tiny island of Pantellaria. Pilot Picard who was accompanying him, on seeing his comrade in trouble also attempted to land on Pantellaria, but was less lucy than Madon, for he crashed on rocky soil and was badly burned when his ship caught fire. As Captain Madon's ship was also a total loss and the third single-seater was "washed out" right at the start when landing on the Nice airdrome, it was decided to call off the expedition. A flying meeting behalf of Pilot Picard is being organized in Tunis by Captain Madon.

## Warning to Aviators

A floating target has been anchored in Limon Bay, Panama Canal Zone on an east and west line between Telfers Island and Limon Point, in 13 ft. of water, at a point about 1,100 yd. southeastward of the two wrecked ships and about 1,400 yd. southwestward of Panama Canal Channel Buoy No. 8. The target is about 20 ft. square, with a 6-ft. mast in the center bearing a red flag, and is painted red and yellow.

This target is for the use of Army airplanes for bombing practice with dummy bombs without explosives, and a patrol will be maintained by the Army during such practice and every precaution taken to insure that the target will not become an obstruction to navigation.

*Trainload of airplanes and spares shipped out of the Curtiss factory in Garden City, L. I., containing the last of the NB Bombers contracted for by the Army Air Service*

All boats should keep away from the vicinity of the target while bombing practice is going on, and anyone observing the target in a location different from that indicated above should notify the Captain of the Port of Cristobal immeditely.

(N.A. 7, 1923.)

H. O. Charts 5000, 5002.
U. S. Coast Survey Chart 950.

## Growth of Aerial Photography

Underwood & Underwood, one of the best known and largest photographic firms, have started an aerial photographic department and are prepared to execute anywhere in the world both oblique and mapping work on a thoroughly businesslike basis.

Associated with Underwood & Underwood in this work is Hamilton Maxwell who has had wide experience in aeronautical surveying and mapping. The Company is now engaged on a contract for surveying 80 odd square miles surrounding Rochester, N. Y. for the Rochester Telephone Co. Mr. Maxwell had a large part in convincing Underwood & Underwood that the time was ripe for them to open a department for aerial photography.

## Media Flying Meet

A very successful flying meet was held at the Media, Pa., Flying Field under the auspices of the Media Business Men's Asseciation, Saturday, June 30.

Continuous flying for six hours by Army and Navy airplanes which included formation flying, bombing and skywriting were the events of the day and were witnessed by a crowd of approximately 5000 people.

There were no accidents to mar the meet, which was sanctioned by the N.A.A., although a spectacular maneuver by Lieut. Louis M. Robb, in which he deliberately wrecked his plane to avoid crashing into the spectators, furnished sufficient excitement for the "thrill hunters."

# U. S. ARMY AND NAVY AIR FORCES

## U. S. ARMY AIR SERVICE

### The Latest Endurance Flight

The following interesting particulars are now on hand regarding the endurance attempts made June 28 at Rockwell Field, Calif., by First Lieuts. Lowell H. Smith and John P. Richter, A. S., when they remained in the air 23 hr. 48 min. While the two fliers did not succeed in breaking the existing world's duration record of 36 hr. 4 min. 31 sec.—made with the Army Fokker T2 by Lieuts. Oakley G. Kelly and John A. Macready, April 17-18, last—they set up on June 28 new marks for speed over approved distances, covering 2500 kilometers in 18 hr. 15 min. 8⅗ sec., and 3000 kilometers in 22 hr. 3 min. 41⅗ sec. It is not known whether this performance was officially observed by officials of the National Aeronautic Association in order that it may be submitted to the Fédération Aéronautique Internationale. Although this flight introduced the novelty of the airplane being refueled in flight, there is no provision in the F.A.I. Rules prohibiting it.

Lieutenants Smith and Richter used a special DH4 which had been remodeled at the Rockwell Air Intermediate Depot. This plane has an extra gas tank back of the rear cockpit fitted with a large opening to allow gas to be delivered from a plane flying above and gasoline, oil and food can be delivered while in flight. Several tests were made and gasoline was successfully transferred to this ship from a DeHaviland 4B1 plane, piloted by Lieut. Virgil Hine, assisted by Lieut. Frank W. Seifert, A.S., The servicing ship is also equipped with special fittings and a 50 ft. length of hose with a quick acting shut-off valve enables the aviators to make contact while flying, fifty feet above. This was successfully carried out on the morning of June 27 and two contacts were made, 25 gal. of gasoline being delivered at one time and 50 gal. the next, but owing to the burning out of the generator on the endurance plane, Lieutenants Smith and Richter were forced to land at Rockwell Field at 10.22 a. m., having been in the air 6 hr. 38 min.

Lieutenants Smith and Richter were very much disappointed over their failure, but determined to accomplish the results for which they had set out, and after installing a new generator and making a few minor changes stood by for the second attempt, which started at 4.44 a. m. the morning of the 28th. During the first twenty laps of the 50 kilometer course fuel was delivered to them twice, while flying at approximately 90 m.p.h. During the day 294 gal. of gasoline were delivered to the speeding plane and 15 gal. of oil. Water and food were also sent up and successfully passed to Lieutenant Richter and by night-fall everything was working fine and the two aviators settled down for the all-night steady grind before them. Fuel enough to run until after 4.00 a. m. of the 29th had been taken aboard late in the evening and a full moon arose over the city, making the visibility excellent for night flying. Pylon 2 located at the old South Spot on North Island had been connected by telephone and at this point all messages from the fliers were received, communication being carried on by messages being dropped in small message bags and transmitted to Headquarters by phone. Messages were also given the aviators by the refueling ship and a telegram filed in Los Angeles at 9.40 a. m. was delivered to Lieutenant Smith in mid-air before noon. During the night several messages were dropped reporting everything working fine and up to 3.00 a. m. nothing had happened to cause any worry on the part of the fliers or the timer stationed on the triangular course. At 3.00 a. m. in the morning of the 29th, a heavy fog bank rolled in from the sea which caused Lieutenant Smith to change his course from the 50 kilometer certified speedway to an inside course of 25 kilometers. At 4.00 a. m. Lieutenants Hine and Seifert went aloft with fuel and at 4.30 made contact but owing to the heavy fog, which by this time formed a thick blanket over the entire course, they were forced to make several attempts before 15 gal. of gasoline could be delivered to the plane and ten minutes later the DeHaviland was forced down on the mud flats east of North Island, approximately half way between Rockwell Field and Coronado, due to the reserve gasoline tank failing to function properly. Neither of the aviators were injured and the big DeHaviland was but slightly damaged, due to the expert handling.

During the flight 309 gal. of gasoline, 15 gal. of oil and two hot meals were delivered to the racing plane.

### Battleship Bombing Tests

Two obsolete battleships, to be scrapped under the Washington Treaty, will be turned over to the Army Air Service for aerial targets, when the treaty is finally ratified, officials of the Navy have decided. The old battleships New Jersey and Virginia, now out of commission at the Boston Navy Yard, have been designated as the ships to be disposed of by the aerial bombs of the Army fliers.

Unless ratifications are delayed, the ships will be bombed off Cape Hatteras between Aug. 20 and Sept. 1. They will not be controlled by radio as was the Iowa, but will be anchored, without reconditioning. Naval officers point out that these vessels are obsolete and do not have armor protecting them from aerial bombardment as modern craft now have.

Squadrons of Martin bombers from the Second Bombardment group based at Langley Field will take part in the fall maneuvers, it is stated. Pilots to engage in the operations are now understood to be in training for bombing at 15,000 ft. and above, from which heights it is understood they will release heavy demolition bombs.

According to officers of the Army Air Service, the maneuvers will be conducted to train the bombardment group for efficient operations at sea and to obtain information as to the accuracy and effectiveness of the large aerial bombs of the 2000 lb. class from high altitudes. It is not a repetition of the ex-German ship bombardment, they point out, but simply target practice for accuracy and efficiency.

### Long Cross Country Flight

Pope Field, Fort Bragg, N. C., with its little Detachment of the 22nd Aero Squadron claims the distinction of having made a trans-continental flight and return in a regular service type DH4B piloted by Lieut. E. P. Gaines with Sergt. A. J. Hilton, Mechanic, around a circuit flown over for the first time by the Army Air Service in one continuous trip. Two Navy planes from San Diego made practically the same flight during the fall of 1922, touching a little further South but not quite as far North as the Pope Field plane. The trip by the Pope Field fliers was made in twenty-eight days, eleven of which were spent in California, as against forty-two days required by the Navy.

The distance from the departure to the return to Pope Field was over six thousand miles. The course touched the Gulf of Mexico, the Pacific Ocean, Lake Michigan, and the Atlantic. Twenty-six landings were made at the following places:—Columbia, S. C., Columbus, Ga., Montgomery, Ala., Baton Rouge, La., Houston, San Antonio, Sanderson, Marfa, and El Paso, Tex., Tucson, Ariz., Yuma, Ariz., San Diego, Los Angeles and SanFrancisco, Reno and Elko, Nev., Salt Lake City, Rock Springs and Rawlins, Wyo., North Platte and Omaha, Neb., Iowa City, Chicago, Dayton, Moundsville, Washington and Pope Field.

The flight was commenced May 18 and terminated June 14, 1923. Lieutenant Gaines and Sergeant Hilton relate many interesting incidents which occurred and report that the trip was extremely pleasant and not in any way difficult.

## Army Orders

Leave of absence of one month to First Lieut. Benjamin R. Morton, A.S.

Maj. Albert L. Sneed, A.S., removed from detached officers' list.

Capt. Edgard Sorensen, A.S., and First Lieuts. Clarence B. Lober and James H. Doolittle, A.S., from McCook Field to Boston for course of instruction at M.I.T.

Sec. Lieut. Lyman P. Whitten, A.S., from Kelly Field to Boston for course of instruction at M.I.T.

Master Sergt. Albert A. Fletcher, from 91st Obs. Sqn., Crissy Field, to 25th Bomb. Sqn., Panama, C. Z.

Master Sergt. Samuel S. V. Schermerhorn, from 42nd School Sqn., Ross Field, Calif., to 91st Obs. Sqn., Crissy Field.

First Lieut. Elmer E. Adler, A.S., from Fairfield, A.I.D., to 88th Sqn., Fairfield, Ohio.

Capt. Benjamin Grant Weir, A.S., promoted to major.

The following cadets, graduates of the U. S. Military Academy, have been appointed second lieutenants, Air Service, and assigned to the Primary Flying School, Brooks Field for training:

Hugh Wagner Downing, Kenyon Moore Hegardt, John Wesley Warren, James Warner Fletcher, John Albert Chambers, Thomas Magnor Conroy, Alfred Louis Johnson, Will Walter White, Clyde Kenneth Rich, Paul Wakefield Wolf, Laurence Carbee Craigie, Charles Wesley Gettys, Charles White Lawrence, Benjamin Stern, Wallace Evan Whitson, Russell J. Minty, Birney Kellogg Morse, Stewart Leon Thompson, Morris Kelly Voedisch, Richard Briggs Evans, Alden Rudyard Crawford, George Gareld Rusk, Thomas Merritt Lowe, David Myron Schlatter, Charles Trovilla Myers, junior, Kenneth Eugene Webber, Charles Aloysius Hennessey, Ernest Byron Thompson, Joseph Harold Hicks, Guy Haines Stubbs, George William Hartnell, Noble Penfield Beasley, Harry Tatum Rowland, John Maurice Weikert, John Hensel Pitzer, William Lawrence Scott, junior, Dean Stanley Ellerthorpe, Bernard Henry Sullivan, Charles Heath Heyl, junior, Lew Myers Morton, John Delany Sureau, John Adams Austin, James Michael Fitzmaurice, Frederick Tuttle Manross, Hoyt Sanford Vandenberg, Ralph Mundon Neal, Stewart Warren Towle, junior, Oscar Carlton Stewart, David Franklin Stone, Glen Clifford Jamison, Bordner Frederick Ascher.

Cadets James Francis Joseph Early, Worcester, Mass.; and John George Salsman, Madison, Wis., graduates of U. S. Military Academy, appointed second lieutenants in Air Service, and assigned to Scott Field for training in Airship and Balloon School.

First Lieut. Cyrus Bettis, A.S., to Selfridge Field upon arrival in United States.

First Lieut. Raphael Baez, jr., A.S., to Mitchel Field upon arrival in United States.

Lt. Col. Harry Graham, A.S., and Maj. Henry W. Harms, A.S., from Office, C.A.S., to Langley Field for course in A. S. Tactical School.

Maj. James W. Bagley, C. Eng., assigned to duty involving flying as aerial photographer.

First Lieut. Neal Creighton, A.S., upon arrival in United States to Scott Field, training in Airship and Balloon School.

Upon arrival in United States, Capt. Lloyd N. Keesling, A.S., to Mitchel Field; Capt. Idway H. Edwards, A.S., to Middletown A.I.D.

Maj. John F. Curry, A.S., from McCook Field to A. S. Engineering School for instruction.

First Lieut. Burnie R. Dallas, A.S., from Crissy Field to McCook Field for instruction in A. S. Engineering School.

Leave of absence of two months to First Lieut. Henry W. Kunkel, A.S.

## McCook Field Entertains Secretary Denby

The Hon. Edwin Denby, Secretary of the Navy, was the guest of honor at an Aerial Demonstration on July 4 at McCook Field, which in variety of performance eclipsed, perhaps, any exhibition of flying ever given at this Post. Lieut. W. H. Brookley, Chief of the Flight Test Branch, had full charge of the program and was one of its most spectacular performers. The McCook Field gates were open to the public and a crowd estimated at 30,000 streamed into the Field or thronged the banks of the river which circle it. Great interest was shown in the T2, famous for its transcontinental non-stop flight, the Air Service Ambulance Plane, A1 (Sister ship of the T2), the Verville-Sperry Racer and other airplanes which were in line for examination by the visitors.

Maj. L. W. McIntosh, Chief of the Engineering Division, Victor Donahey, Governor of Ohio, Colonel Gunkel and other guests of distinction, formed a party who with Secretary Denby occupied a special reviewing stand for witnessing the flying.

Formation flying, with five DH4's from Wilbur Wright Field, led by Major Knerr, opened the program. With these ships at altitude, Lieut. "Jimmie" Doolittle in the DH4G, which was mounted with ten machine guns, flew low over the Field with the guns operating. This was followed by a parachute demonstration, in which dummies were sent off from the Martin Bomber. A 64 ft. parachute, which is the largest known parachute in the world, was dropped from an observation balloon, carrying the basket and weight equivalent to a crew of five. Live parachute jumps were made by Alva F. Starr, A.C.R., James R. Ingram, A.C.R., and Lyman H. Ford, A.C.R. Lieutenants Van Veghten and Brookley were pilots in these events. There was a bombing demonstration by Lieutenant Fletcher, aerial combat work by Lieutenants Doolittle and Van Veghten, formation stunt flying by Lieutenant Pearson, holder of the thousand kilometer world speed record, and Lieutenant Brookley. This formation work was so perfect that it seemed in the loops and turns as if but one plane were in the air. Lieutenant Brookley also accomplished some startling effects with smoke signalling, bringing forth cries of appreciation from the onlookers.

One of the most delightful performances of the afternoon however, was that of the inanimate target glider which was taken up attached to the upper wings of a JN airplane, to an altitude of about 800 ft., by Lieutenant Carroll, and then released. Its first astonished movement upon discovering itself free in the air was to describe a loop and for a second it seemed that it must stall and plunge to earth. But almost as if directed by a will, it righted itself, dove down, swooped off at a gentle climb toward the sky, at the peak of the climb seemed about to stall, righted itself, dove down and accomplished another gentle curve upward. This graceful curving and frolicking across the sky lasted several minutes, though to spectators it seemed much longer. As it gradually lost altitude, the dimensions assumed more the proportions of a full sized airplane and it was easy to realize the value of this contrivance as a practice target for our anti-aircraft gunners. As if possessed of dramatic instinct, the buoyant little glider did not descend in sight of the crowd, but when last seen was still planing bravely, disappearing behind a line of office buildings. When borne back to the Field upon the shoulders of a guard a few minutes later, there was an attitude of respect as well as amusement in the glances that followed it.

## Added Comfort for Altitude Flying

A small cockpit heater, 15 in. wide, 2 in. deep, and constructed of 9 in. standard radiator tubing, has been devised at McCook Field for making use of the circulating water from the engine to heat the cockpit, thus making altitude flying less of a punishment. Above 20,000 ft. it is difficult to keep warm under the most favorable conditions. On the first altitude flights made with a supercharged LePere, Major Schroeder and Lieutenant Elsey suffered extremely from the cold. Before Lieutenant Macready's flight to 40,800 ft., the pipe from the water heater to the radiator was passed through the pilot's cockpit and supplied a small amount of heat.

Later the heater above referred to was substituted, insuring a comfortable temperature for the pilot for the zero degrees of Fahrenheit. This heater is placed on a line between the radiator expansion tank and the main radiator in the pilot's cockpit. On warm days and near the ground the heat from this device is excessive, so a bypass line with a valve to control the amount of water passing through the heater has been added to regulate the temperature, even as the business man may do. This heater adds but a few pounds increase of weight to the airplane.

### New Wrecking Truck

The 68th Service Squadron at Kelly Field is about to complete a special wrecking truck. Special steel bows have been built and installed on the body of a White Truck. Suspended from these bows is a track fitted with a chain hoist. This track extends far enough from the rear of the truck to make it possible for an airplane motor to be hoisted from the ground to the truck or to the plane.

## U. S. NAVAL AVIATION

### Personnel Notes

Lieut. Comdr. H. J. Bartlett has been ordered to the Bureau of Aeronautics and will be in the Plans Division. Lieut. Comdr. Bartlett has been the Squadron Commander, Torpedo and Bombing Plane Squadron Number One, Air Squadrons Scouting Fleet since its organization in 1920. He has been identified with aerial torpedo development since its inception in the U. S. Navy. Lieut. Commander Bartlett was in charge of the operations of the torpedo plane squadron during the first maneuvers that were held by those planes with the Fleet last September.

Lieut. Comdr. H. B. Cecil was at Fort Hamilton, New York City, on July 16 and 17 on an inspection and visit to the Naval Reserve Aviation Unit there. In his official report to the Bureau of Aeronautics Lieut. Commander Cecil states: "The spirit and interest shown by the personnel in their work appears to be very good. I inspected the organization at formation and was very well pleased with its appearance."

Lieut. George R. Pond, U.S.N.R.F., and Aviation Chief Machinist Mate Wayne L. Carlton have been ordered to Boston for duty in connection with the training of Reserve Naval Aviation Unit at that city. Lieutenant Pond has been stationed at the Naval Air Station at Anacostia, D. C., for the past three months and has been very active in the flying operations at that station.

Aviation Chief Machinist Mate Eugene S. ("Smoky") Rhoads, of NC4 trans-Atlantic fame has been ordered to New York City for similar duties.

### TR3 Seaplane in Schneider Cup Race

A TR3A seaplane has been added to the CR3 and NW2 planes that will represent the United States Navy in the Schneider Cup Seaplane Race to be held at Cowes, England, on Sept. 28.

The TR3A is a double pontoon seaplane with a Wright E4 engine of 300 hp. A similar type, the TR1, won the Curtiss Marine Trophy last year at Detroit, with a speed of 112.65 m.p.h. over a 160 mile course. It is expected that the TR3A will be able to better that speed very materially, as its engine is considerably higher powered than the one that brought the TR1 to victory last year.

### Submarine Planes Ready

The MS submarine planes from the Glenn L. Martin Co. at Cleveland are now ready for shipment. Five of them will be sent to the Naval Air Station at Hampton Roads, Va., and one to the Naval Air Station at Anacostia, D. C. The planes at Hampton Roads will be put into actual service with submarines as soon as practicable. The plane at Anacostia will be used for experimental and test purposes.

These planes will be the first planes to be placed on submarines on this side of the Atlantic. They are to be used for observation and scouting work in connection with submarine operations.

### Miscellaneous Notes

Authority has been granted to establish a Naval Reserve Air Station at Squantum, Mass., near Boston. There is a hangar on one end of the station, and Bureau of Aeronautics is going to send two or three planes up there. This makes two of these stations, one at New York and one at Boston.

The ZR3 will probably come over from Germany in November and Captain Steele now at Lakehurst, N. J. is very hopeful that there will be enough men to receive the ship when she finally arrives on this side.

### Transatlantic Flight of the ZR3

Weather information, based on conditions in past years, is being assembled by the Aerological Section of the Bureau of Aeronautics for the trans-Atlantic flight of the airship ZR3, now building for the United States at Friedrichshafen, Germany. This information will be given to Capt. G. W. Steele, U.S.N. who is leaving for Germany this month to see the finishing stages of the construction of the airship and to accompany her on the trip back. Captain Steele will take command of the ZR3 upon her arrival in this country.

### Cruiser Milwaukee to Have Planes

Two UO1 planes and catapults are to be mounted on the scout cruiser Milwaukee. Lieut. Ralph Wyman and Ens. H. J. McNulty with eight aviation enlisted men have been detached from the Air Squadrons, Battle Fleet, to serve as the aviation detachment on that vessel. The planes on the Milwaukee will be used for observation and scouting purposes and will conduct operations in those activities during the coming trip of the cruiser to the South Pacific Ocean.

### F5L's Tow Aquaplanes at Coco Solo

Aquaplane racing, with F5L's towing the aquaplane, has been introduced at the Naval Air Station, Coco So'o, C. Z. This is the first time that aquaplaning has been done in the Canal Zone. On July Fourth, as part of the celebration, two F5L's, towing aquaplanes had a race. The outfit piloted by Carpenter W. E. Redfern towing Carpenter's Mate Brittle won from the plane of Lieut. J. E Dyer towing A. A. Doyle, a civilian.

### Wright and Planes at Newport

The Air Squadrons Scouting Fleet, consisting of eleven F5L scouting planes and eleven DT torpedo planes are now at Newport, R. I., together with the aircraft tender Wright. The squadron will remain at Newport for the summer. While there exercises in practice bombing war games and gunnery exercises will be undertaken in preparation for the target practice to be held in Chesapeake Bay next fall.

### Air Squadrons, Battle Fleet

Nine planes of the Air Squadrons, Battle Fleet, left San Diego on July 20 for Camp Lewis, Wash. They will fly by way of Crissy Field, San Francisco. These are a part of the twelve fighting planes that are to go to Sand Point, Wash., where they will remain until September.

### San Diego Smoker

A smoker held by the officers and men of the Naval Air Station, San Diego, Calif., on July 3 netted a profit of $506.50. Fifty dollars of this was donated to a fund being collected for the child of the late Lieutenant Beatty. The remainder was given to the Naval Aid Society.

## COMING AERONAUTICAL EVENTS

DOMESTIC

Oct. 1-3 — National Airplane Races, St. Louis, Mo.
Late Fall — Curtiss Marine Flying Trophy Race

FOREIGN

July 20-Aug. 12 — International Aero Exhibition, Gothenburg, Sweden
Aug. 3-31 — Sailplane Meet, Rhoen, Germany
Aug. 5-26 — Sailplane Meet, Vauville, near Cherbourg, France
Sept. 23 — Gordon Bennett Balloon Race, Brussels, Belgium
Sept. 28 — Schneider Maritime Aviation Trophy Race, Cowes, Isle of Wight, England
Dec. 1 — Entries close for French Engine competition

## Economy Urged upon All Aviation Units

A circular letter to all Fleet units and Naval Air Stations which has been prepared and sent out by the Bureau of Aeronautics, draws the attention of all stations to the necessity of exercising rigid economy to reduce maintenance charges. "The 1924 appropriation is slightly less than the 1923 appropriation," says the letter, "and, although apparently the amount for maintenance has been increased, there is actually no increase, as it was impracticable to run the existing aviation on the amount allowed.

"While these increases are well justified by the increased activities and the higher wage scales, the size of the 1924 appropriation justifies no increase whatsoever. Whenever an increase is made for one station, it necessitates a decrease somewhere else. As aviation in the Navy is expanding everywhere, and especially in the Fleets, the demands on the Bureau for aviation material and for new planes are on the increase. In addition, somewhere money must be found to provide for the operation of the ZR1 and the ZR3. It is difficult to see how the Bureau is going to make ends meet without reducing the operating squadrons, unless Commanding Officers of Stations are able to work out the solution by operating increased forces on less money. This applies particularly to those stations whose monthly charges exceed $10,000 and form the bulk of aviation expenditures.

"In deciding on the amount necessary for routine maintenance, Commanding Officers are urged to keep this figure as low as possible, and to list all other work. It is hoped that Commanding Officers will give this their personal attention, and that, before requests for allotments for August are signed, they will review the records and correspondence of the station on this subject for the past eighteen months in order to make sure that routine maintenance has been reduced to the lowest practical limit."

## A Free Balloon Practice Flight

The following account of a practice flight by Lieut. L. J. Roth and Lieut. T. B. Null, U.S.N., who were lost in Lake Erie during the National Balloon Race, is of interest. The account is from the Naval Air Station, Lakehurst, N. J., and is by Lieut. Comdr. H. J. Klein, Jr.

"Lieut. L. J. Roth and Lieut. T. B. Null set out on Wednesday, June 13, for a practice flight. With light winds they drifted across the Deleware River near Philadelphia, and everything pointed toward a landing in Pennsylvania or Virginia about Friday morning. However, the wind changed to north west, taking them back across New Jersey. About 2 A. M. on Thursday, while at an altitude of 6,000 ft., Delaware Bay and the Atlantic Ocean loomed up through the fog directly ahead. The situation called for quick action or wet feet at the least, so a quick landing was made, but before the balloon reached the ground it was found that what had seemed to be a fog was a horde of Jersey mosquitoes on their nightly prowl. However, a landing was made about 100 ft. from the shore with an off shore breeze. To make matters worse, they were in a swamp with no possible way of getting the balloon out except by air. After the balloon was made fast there was nothing to do except fight mosquitoes and wait for the wind to shift. The former was all in favor of the mosquitoes. The only protection against them was to wear a fur lined flying suit which kept all except the largest and most voracious at bay. However, this is not an ideal costume for a hot June morning, so the second round was won by the Jersey Eagles when the sun came up and the suits had to be taken off. Finally at 1:30 p. m. the wind shifted and no time was lost in making a final landing in more hospitable territory."

## Sociable Pigeon Loses Race

A pigeon race was held on July Fourth between two birds from the Naval Air Station, Coco Solo, Canal Zone, and two birds from the Army Air Station at France Field, C. Z. One each from each station was released simultaneously. One Navy pigeon won from the Army bird by twenty-six minutes. The other Navy pigeon lost out by sixteen minutes, due to a sociable call, not in line of duty, made on some pigeons from the loft of Fort Davis, an Army post in the Canal Zone, while the race was still on.


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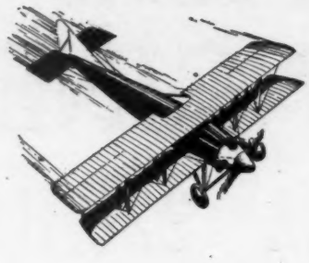

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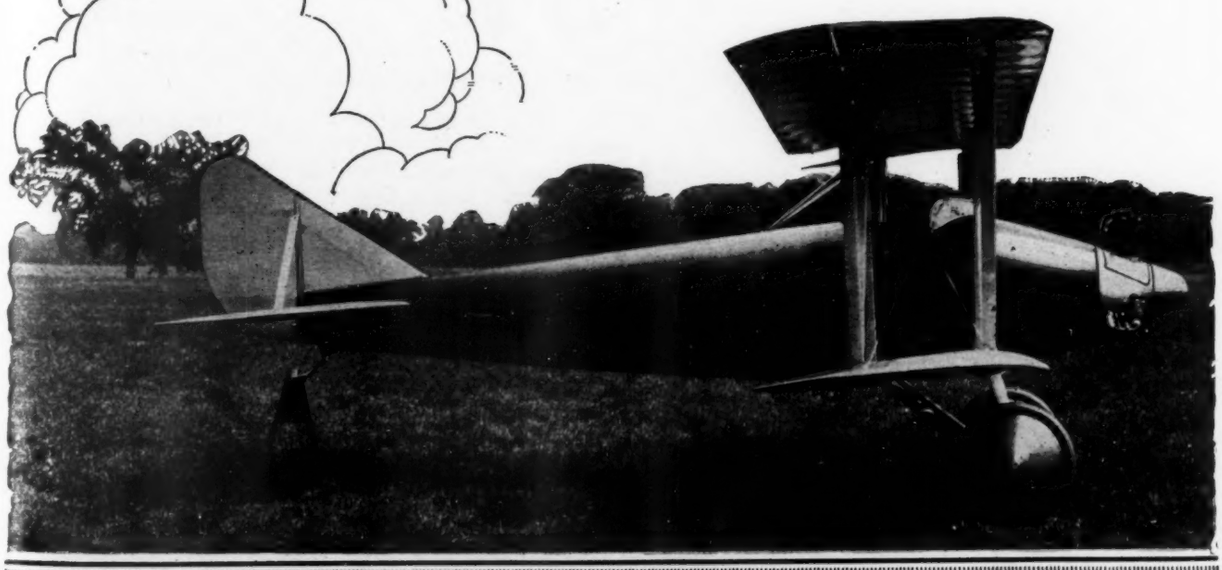

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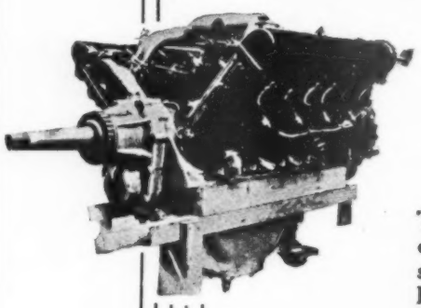

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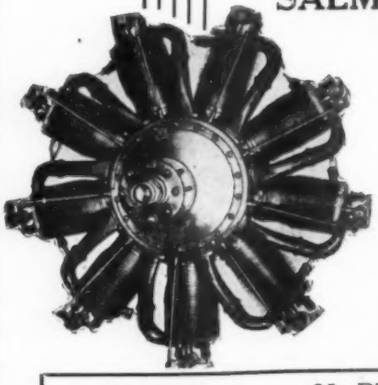

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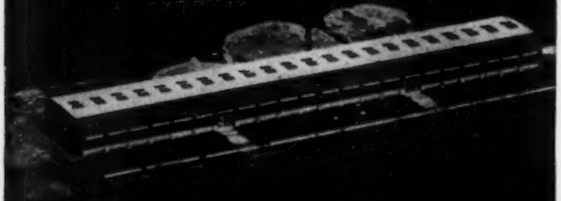

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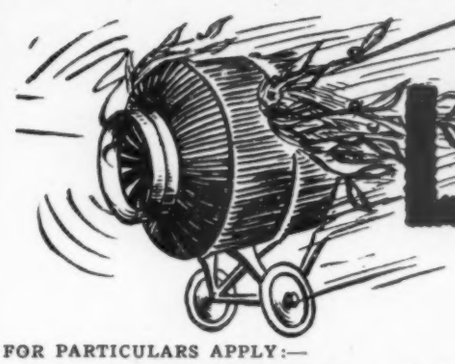

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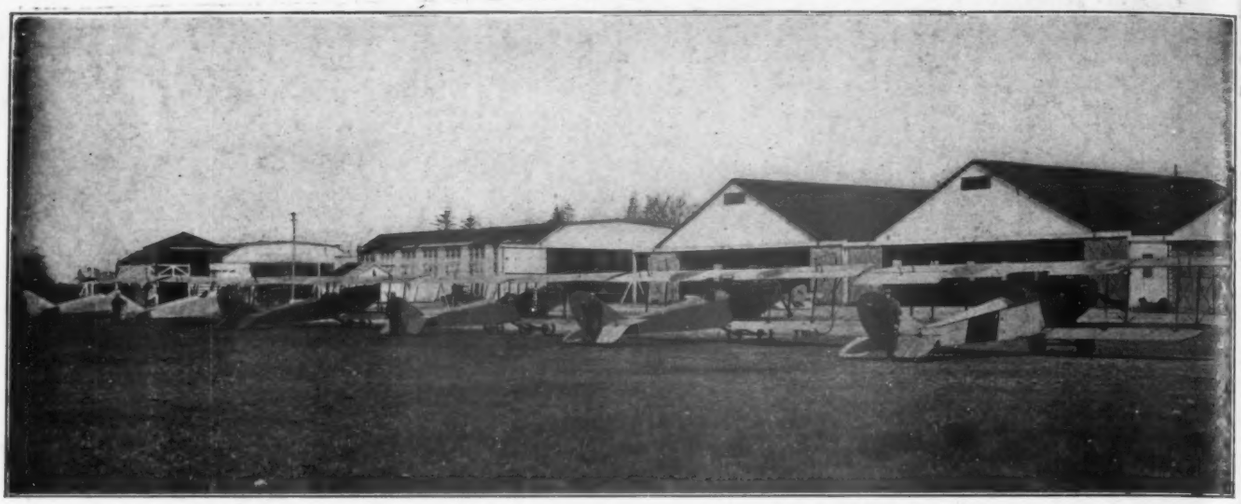

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